


**WEST VIRGINIA
GEOLOGICAL SURVEY**





Digitized by the Internet Archive
in 2012 with funding from
LYRASIS members and Sloan Foundation



Scene on Guyandot River near Mouth.

WEST VIRGINIA GEOLOGICAL SURVEY



Cabell, Wayne and Lincoln
Counties.

By

C. E. KREBS, Assistant Geologist.
and
D. D. TEETS, JR., Field Assistant.

I. C. WHITE, State Geologist.



WHEELING NEWS LITHO. CO.
WHEELING, W. VA.

1913

GEOLOGICAL SURVEY COMMISSION.

HENRY D. HATFIELD.....*President*
GOVERNOR OF WEST VIRGINIA.

E. L. LONG.....*Vice-President*
TREASURER OF WEST VIRGINIA.

ARCHIBALD MOORE.....*Secretary*
PRESIDENT, STATE BOARD OF AGRICULTURE.

THOMAS E. HODGES.....*Treasurer*
PRESIDENT, WEST VIRGINIA UNIVERSITY.

E. DWIGHT SANDERSON.....*Executive Officer*
DIRECTOR, STATE AGRICULTURAL EXPERIMENT STATION.

STATE BOARD OF CONTROL.

JAMES S. LAKIN.....*President*

E. B. STEPHENSON.....*Treasurer*

JOHN A. SHEPPARD.....*Member*



SCIENTIFIC STAFF

I. C. WHITE.....*State Geologist*

SUPERINTENDENT OF THE SURVEY.

RAY V. HENNEN.....*Assistant Geologist*

CHARLES E. KREBS.....*Assistant Geologist*

DAVID B. REGER.....*Assistant Geologist*

D. D. TEETS, JR.....*Field Assistant*

BERT H. HITE.....*Chief Chemist*

JAN B. KRAK.....*Assistant Chemist*

EARL M. HENNEN.....*Chief Clerk*

JENKIN L. WILLIAMS.....*Stenographer*

LETTER OF TRANSMITTAL

To His Excellency, Hon. Henry D. Hatfield, Governor of West Virginia, and President, West Virginia Geological Survey Commission:

Sir: I have the honor to transmit herewith the Detailed County Report and accompanying topographic, geologic and soil maps of Cabell, Wayne and Lincoln counties, prepared by Assistant Geologist C. E. Krebs and his Field Assistant, D. D. Teets, Jr. This Report has been delayed several months awaiting the appropriation of funds with which to publish the same, but as these have now been generously provided at the last (1913) session of the Legislature, this, as well as the delayed Report on Monongalia, Marion and Taylor counties by Ray V. Hennen and D. B. Reger, can now be published in a short time, to be followed immediately by the Report on Kanawha county by Krebs and Teets, and the Report on Preston county by Hennen and Reger.

The mineral wealth of the area herein described consists mostly of coal, petroleum and natural gas, aside from clays and shales for brick and tile, and sandstones, gravels, and sands for building and structural materials. There are occasional deposits of iron ores, but they are mostly in the form of nuggets whose mining on a commercial scale will prove so expensive that competition with more abundant and richer deposits would at the present time be simply impossible. In the remote future it may be practicable to utilize these low grade ores, but not until after the richer ones of the country have been largely exhausted.

The coal beds of this district do not assume much importance until in the southern half of the area, when the southward rise of the strata brings to the surface the members of the Allegheny and Kanawha series, but even then only the northwestern phase of the upper portion of the Kanawha coals is available, and hence the best development of the latter does

not occur within these counties, since all the coal beds of southwestern West Virginia tend to thin down and disappear as they are followed toward the Ohio river. For this reason as well as the very irregular thickness and distribution of the famous Pittsburgh seam, there has not yet been any activity in the commercial production of coal within these three counties, except in the southern portions of Wayne and Lincoln.

Petroleum and natural gas are abundant in both Lincoln and Wayne counties, while small pools of oil and gas have been found in Cabell, the oil field near Milton having been the first one developed south from the Great Kanawha river, while the Griffithsville oil field of Lincoln county has proven quite large and valuable although none of the wells has been in the gusher class. Geological structure renders it doubtful if any pools of either gas or oil of much value will ever be found in the northern halves of either Cabell or Wayne counties, since the strata lie too flat and regular to permit of oil and gas accumulation into pools of commercial importance. In the southern portions of Cabell and Wayne, and all of Lincoln, the dip of the rocks steepens up however, and these areas will furnish a good field to the oil and gas prospector for many years to come.

The soils of the area constitute one of its most valuable assets, and they are fully described by W. J. Latimer, the expert of the U. S. Bureau of Soils in Chapter XIV, page 424 of this Report. The suggestions there given to the farmer for the improvement of his crops by the proper course of rotation, and fertilizers should be carefully read by all those interested in agriculture and horticulture. The cultivation of the Tobacco plant has proven a very profitable industry in this district, and with proper attention to renewal of the elements which the growing of Tobacco so rapidly exhausts, this industry should continue to be profitable for a long time in the future.

Very respectfully,

I. C. WHITE, STATE GEOLOGIST.

Morgantown, W. Va., April 15th, 1913.

CONTENTS.

	Page.
Members of Geological Survey Commission and State Board of Control.....	III
Members of Scientific Staff.....	V
Letter of Transmittal.....	VI
Table of Contents.....	VIII-XII
Author's Preface.....	XIII

PART I. HISTORY AND PHYSIOGRAPHY.

Chapter I.—Historical and Industrial Development.....	1-22
Location	1
History of Transportation.....	1-5
Ohio River.....	1-2
Guyandot River.....	2
Big Sandy River.....	3
Chesapeake & Ohio R. R.....	3-4
Coal River R. R.....	4
Norfolk & Western R. R.....	4
Baltimore & Ohio R. R.....	5
Camden Interurban Electric Road.....	5
Guyandot & Charleston Turnpike.....	5
General Description.....	5-22
Cabell County.....	5-12
Miscellaneous Items.....	5-8
Towns and Industries..	8-12
Lincoln County.....	12-17
Miscellaneous Items.....	12-15
Towns and Industries.....	15-17
Wayne County.....	17-22
Miscellaneous Items.....	17-20
Towns and Industries.....	20-22
Chapter II.—Physiography.....	23-33
Physiographic Changes.....	23-27
Description of Drainage Basins.....	27-32
Topography of the Land Area.....	32-33

PART II.—GEOLOGY.

Chapter III.—General Geology.....	34-80
Table of Geologic Formations in West Virginia.....	34-35
Cabell County Sections.....	35-48
Lincoln County Sections.....	48-68
Wayne County Sections.....	68-80
Chapter IV.—The Dunkard Series.....	81-83
Description of Formations.....	81-83
Chapter V.—The Monongahela Series.....	84-109
Cabell County Sections.....	84-93

	Page.
Lincoln County Sections.....	93-95
Description of Formations.....	96-99
Pittsburgh Coal Openings.....	100-109
Chapter VI.—The Conemaugh Series.....	110-142
Wayne County Sections.....	110-117
Description of Formations.....	117-142
Marine Fossils.....	132-134
Chapter VII.—The Allegheny Series.....	143-224
Sections	143-162
Description of Formations.....	162-222
Flora of Allegheny Series.....	223-224
Chapter VIII.—The Pottsville Series.....	225-274
General Account.....	225-226
Sections	226-232
Description of Formations.....	233-274
Chapter IX.—Geologic Structure.....	275-280
Methods of Representing Structure.....	275-276
Synclines and Anticlines.....	277-280

PART III. MINERAL RESOURCES.

Chapter X.—Petroleum and Natural Gas.....	281-388
Oil and Gas Horizons.....	281-283
Description of Sands.....	283-287
Oil and Gas Development, Historical.....	287
Cabell County Well Records.....	287-310
Summarized Records.....	290-295
Union District.....	295-296
Grant District.....	296-305
Barboursville District.....	305-307
Guyandotte District.....	307-309
McComas District.....	309-310
Lincoln County Well Records.....	311-370
Summarized Records.....	312-331
Washington District.....	332-334
Jefferson District.....	335-338
Duval District.....	338-355
Union District.....	355-357
Sheridan District.....	357-364
Carroll District.....	364-366
Laurel Hill District.....	366-367
Harts Creek District.....	367-370
Wayne County Well Records.....	370-387
Summarized Records.....	372-373
Ceredo, Butler and Union Districts.....	374-376
Stonewall District.....	376-381
Grant District.....	381-383
Lincoln District.....	383-387
Effect of Geologic Structure in Oil and Gas Distribution.....	387
Prospective Oil and Gas Territory.....	387
Chapter XI.—Coal.....	389-408
Statistics of Coal Production.....	389-392
Coals of the Monongahela Series.....	394-396
Coals of the Conemaugh Series.....	396-397

	Page.
Coals of the Allegheny Series.....	397-400
Coals of the Pottsville Series.....	400-403
Summary of Available Coal.....	403
Table of Coal Analyses.....	404-405
Page References of Mines.....	404-408
Chapter XII.—Clays, Road Materials, Building Stones, Iron Ores and Carbon Black.....	409-418
Clays and Clay Industry.....	409-416
Road Material.....	416-417
Building Stone.....	417-418
Salt Water.....	418
Chapter XIII.—Description and History of Timber.....	419-423
Cabell County.....	419-420
Lincoln County.....	420-422
Wayne County.....	422-423
Chapter XIV.—Soil Survey.....	424-457
Climate	427-428
Agriculture	429-436
Soils	436-456
Summary	456-457
Appendix—Levels Above Mean Tide.....	458-473
Index	474

ILLUSTRATIONS.

Maps in Atlas (under separate cover).

Topographical Map of the Cabell-Wayne-Lincoln Area.
Map Showing Economic Geology and Structure Contours.
Soil Map of the Cabell-Wayne-Lincoln Area.

Plates.

Scene on Guyandot River near Mouth.....Frontispiece

No.	Facing Page
I.—Abandoned C. & O. Railroad Grade Used as a Turnpike in Teays Valley, Cabell County.....	3
II.—Birdseye View of Hamlin, W. Va., Conemaugh Series.....	15
III.—Amy, Lincoln County.....	17
IV.—Ohio River, Looking West near Cox Landing, Cabell County	23
V.—Ohio River, South of Cox Landing, Cabell County.....	27
VI.—Guyandot River Valley Looking East from a Point near Wilson Station.....	28
VII.—Scene Along Coal River, near Sproul.....	31
VIII.—Griffithsville Oil Field, Conemaugh Series, East of Griffithsville, Lincoln County.....	49
IX.—Griffithsville, Looking East, Conemaugh Series.....	51
X.—Old River Deposit, Along Guyandot River at Barboursville, Cabell County.....	85
XI.—Outcrop of the "Pittsburgh" Sandstone on Cabell Creek, Cabell County.....	91
XII.—Guyandot Valley, near Guyandotte, Showing Conemaugh Series	111
XIII.—Eureka Pipe Line Pumping Station, Hamlin, Lincoln County	131
XIV.—"Homewood" Sandstone Cliff, near Saltpeter, Wayne County	161
XV.—Rock Quarry in "Homewood" Sandstone, Saltpeter, Wayne County	161
XVI.—Scene on Coal River, near Forks of Coal, Showing the Saltsburg Sandstone, Top of Hill.....	171
XVII.—Sproul Tunnel on the Coal River Branch of the Chesapeake & Ohio Railway, Showing the "Homewood" Sandstone	225
XVIII.—Mining Camp of Kenova Coal Company, Branchland, Lincoln County.....	230
XIX.—Kanawha Series, Along Coal River North of MacCorkle, Lincoln County.....	230
XX.—Pumping Sand out of Coal River, at Forks of Coal.....	248
XXI.—Mining Camp of Branchland Coal Company, Branchland, Lincoln County.....	262

	Page.
XXII.—Coal Tipple of Kenova Mining Company, Branchland, Lincoln County.....	268
XXIII.—Shooting the Octavia Hager Well No. 5, in the Griffiths-ville Oil Field.....	285
XXIV.—Drilling Well of Columbia Gas & Electric Company, Patent Drilling Machinery, Branchland, Lincoln County.....	288
XXV.—Fig. 1.—Teays Valley, near Milton.....	440
Fig. 2.—A characteristic View of Teays Valley, Looking East from Point near Milton.....	440
XXVI.—Fig. 1.—Characteristic Topography of the Dekalb Stony Silt Loam, and Tobacco and Corn on the Smoother, Less Stony Slopes, near Rector, on Big Ugly Creek.....	440
Fig. 2.—A section of Tyler Silt Loam as shown in Stream Bank at Barboursville, W. Va.....	440

Figures.

1 and 2. Sketch Maps of the State, Showing Area Surveyed....	XIV
3. Diagram Showing Relative Position of the Coals in the Cabell-Wayne-Lincoln Area.....	83
4. Sketch Map Showing Approximate Area of Pittsburgh, Upper Freeport and No. 2 Gas Coals.....	89
5. Sketch Map Showing Approximate Area of No. 5 Block Coal in Lincoln and Wayne Counties.....	185
6. Sketch Map Showing Distribution of the Stockton-Lewiston Coal	254

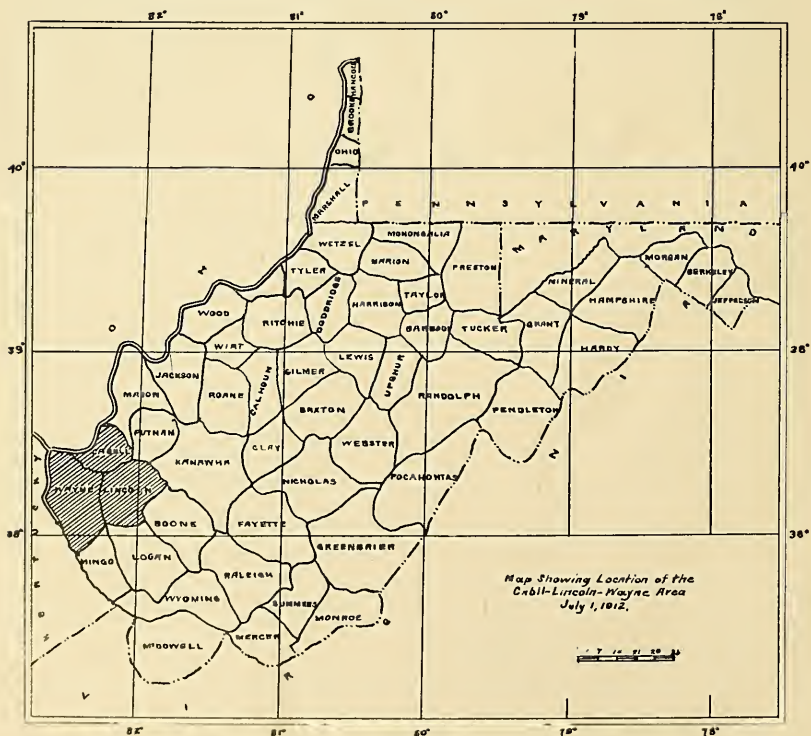
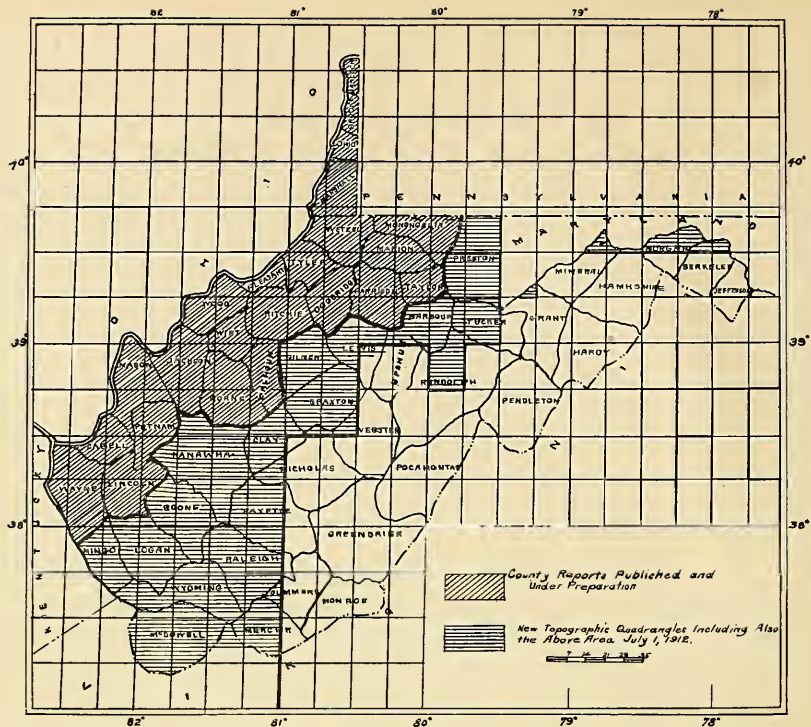
AUTHOR'S PREFACE.

The object of this volume is to collect and assemble the present knowledge, including a large amount of hitherto unpublished data collected by the writer and assistant in the field, not only of the general geology, but of the economic resources of the area in the way of minerals, and to present it in a convenient form for those who are interested in their study and development.

The report gives (1) a brief history of the counties and their development; (2) a study of their surface features or their physical geography; (3) the general and detailed geology of the area; (4) the geologic structure, with a contour map of the Pittsburgh coal bed; (5) oil and gas fields of the three counties, with suggestions for their future development; (6) the coal resources and the chemical composition, calorific value, and fuel ratio of the coal; (7) the clays, road material and building stone; (8) a chapter on the timber of the area; (9) a chapter on the soils of the area; (10) an appendix showing the tidal elevations within the area.

One of the most valuable features of the report is the determination and representation of geologic structure. The tidal elevation of the top of the Pittsburgh coal horizon has been determined all over the area and a contour map constructed to show how it lies. These contours, 25 feet in elevation apart, are shown on the general and economic map accompanying the report in a separate cover. By referring to this map, the approximate position of the Pittsburgh coal horizon can be told at a glance, and the shape and location of the anticlines and the synclines, and the direction of the dip and strike of the rocks at any point, a knowledge of which is of greatest importance not only in the development of the oil and gas pools within the area, but also for the future mining of the several beds of coal, where the latter are of commercial thickness and purity.

The chapters on the general and detailed geology, although



somewhat technical in their nature, give a large fund of knowledge about the formations of the different series. In these chapters the writer has given the general and accepted classification of the rocky strata which permits comparison with the formations in other counties in West Virginia, and in other States.

The chapter on oil and gas gives a short account of the early development of the different fields, together with the logs of a large number of the wells not heretofore published, thus preserving from loss a great fund of information concerning the depth and thickness not only of the several oil and gas horizons, but also of the several coal beds.

The chapter on the coal gives the character, thickness, chemical composition, calorific value and fuel ratio of the several coal beds together with an estimate by the writer of the approximate available coal tonnage and probable area of each apparently merchantable coal seam in the three counties with a final summary of the total available tonnage of coal in the Cabell-Wayne-Lincoln area.

Interesting data are also given in the chapter on clays and road materials and building stone. Also the chapter on soils gives valuable information for the wide-awake and progressive farmers within the area. This chapter was prepared by Mr. W. J. Latimer of the Bureau of Soils of the U. S. Department of Agriculture, Washington, D. C., who is an expert on the study of soils.

Three maps of the entire area accompany this report in a separate cover, one of which shows by the use of colors and contour lines the character of the surface, the roads, streams, railroads, etc.; another by the same means illustrates both the general and economic geology by showing the outcrop of the different series and the horizons of four coal beds; viz., Waynesburg, Pittsburgh, Upper Freeport, and No. 5 Block. the oil and gas wells, dry holes, and structure contours of the Pittsburgh coal; the third, or soil map, shows by the use of colors and symbols the character, classification and distribution of the soils.

The writer and his assistant, Mr. D. D. Teets, Jr., devo-

ted the summer season of 1911 to gathering data for this volume. Much valuable aid and assistance were rendered by farmers and other residents of the area, also by the officials of the several companies engaged in the development of the oil, gas and coal fields. In the text due credit and acknowledgment have been given for all such data obtained.

The chemical analyses were made in the Survey laboratory by Messrs. J. B. Krak, Assistant Chemist, and Hubert Hill, under the direction of Prof. B. H. Hite, Chief Chemist.

The writer wishes to express his obligation to Dr. I. C. White, State Geologist, whose revision and suggestions have added greatly to the value of this report.

C. E. KREBS.

Charleston, W. Va., August 24th, 1912.

ERRATA.

Page 111. Under the Bowēn section, thickness and depth for Grafton sandstone should be 35 ft. and 405 ft. respectively.

Page 227. Under the title, "Wilsondale Section," read Lincoln "district" instead of Lincoln "county."

Page 228. Description in last paragraph on this page applies to the Kermit section on page 231.

PART I.

The History and Physiography of the Cabell-Wayne-Lincoln Area.

CHAPTER I.

THE HISTORICAL AND INDUSTRIAL DEVELOPMENT.

LOCATION.

That portion of West Virginia discussed in this report embraces the area located on the southwestern part, and the most western portion of the State, bounded by Ohio on the northwest and Kentucky on the southwest. The area is situated between parallels $30^{\circ} 35'$ and $37^{\circ} 50'$ North latitude, and between $4^{\circ} 50'$ and $5^{\circ} 40'$ Longitude West from Washington and $81^{\circ} 50'$ and $82^{\circ} 40'$ from Greenwich. The three counties contain an area of 1241.35 square miles as follows: Cabell, 271.77; Lincoln, 448.76; and Wayne, 520.82 square miles.

HISTORY OF TRANSPORTATION.

Waterways.

The Ohio river bounds Cabell county on the west and has for many years been used as a great waterway from Pittsburgh to New Orleans. It is now being locked and

dammed between Cairo and Pittsburgh so as to have a nine-foot stage of water throughout the entire year. Locations have been made for twenty-nine locks from Pittsburgh to Kenova; Lock No. 29 being located a short distance below Kenova. Lock No. 28 is located at the west end of Huntington, near the Wayne county line, and is now under construction. The location for Lock No. 27 is four miles above Guyandot, but no work has yet been done on its construction.

The following facts in regard to these Locks have been kindly furnished by F. W. Altstaetter, Captain, Corps of Engineers, Wheeling, W. Va.:

Location of Dams and Elevations of Locks Walls, Ohio River.

(Elevations are referred to mean sea level—Sandy Hook, N. J., datum.)

Dam No.	Distance below "Point Bridge" Pittsburgh Miles	Elevation of crest of dam.	Elevation of top of abutment	Side of river for lock.	LOCATION
27	300.2	517.0	514.0	Ohio	4 ms. above Guyandot, W. Va. (Not yet built).
28	310.9	510.6	507.6	"	Huntington, W. Va., (Not yet built).
29	319.4	503.5	500.5	Ky.	3 ms. below mouth of Big Sandy river. (Not yet built).

Guyandot River.

The Guyandot river, which empties into the Ohio at Guyandot, is not large enough for steamers, but for years freight was transported on same in flat boats, pushed with poles by men located at the stern and bow of the boats; but since the Guyandot Branch of the Chesapeake & Ohio Railroad has been completed, this method of transporting freight has been abandoned.

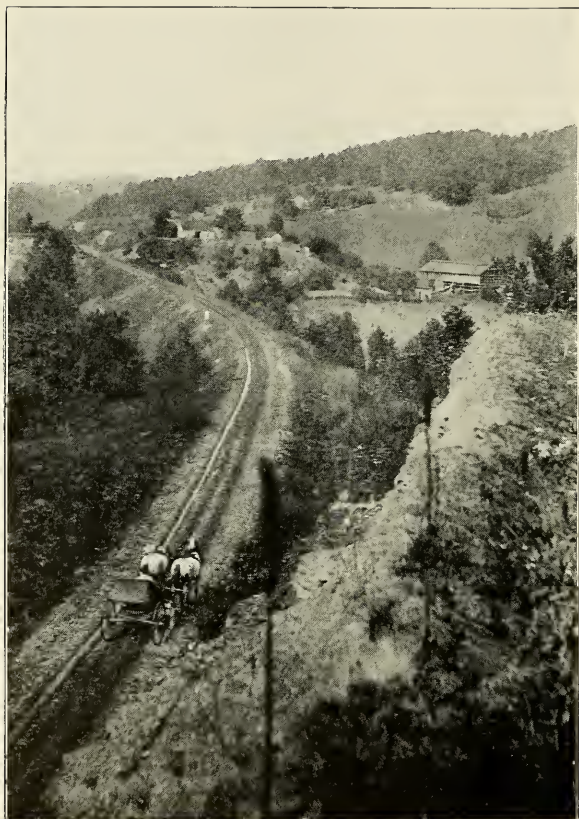


PLATE I.—Abandoned C. & O. Railroad Grade Used
as a Turnpike in Teays Valley, Cabell County.

Big Sandy River.

The Big Sandy river divides Wayne county from Kentucky on the west and flows into the Ohio at Kenova. This river has been locked and dammed and when the last Lock planned is completed, navigation will be open as far as Glenhayes on Tug Fork. At present navigation ends at Fort Gay.

The following facts with regard to these Locks have been kindly furnished by Mr. Lucian S. Johnson, Junior Engineer, Louisa, Ky.:

**Location and Elevation of Locks and Dams on Big Sandy, and
Tug and Levisa Forks, Big Sandy River,
West Virginia and Kentucky.**

Lock No.	Location above mouth Big Sandy	Size of Lock Chamber	ELEVATIONS.					Length of Pass	Length of Weir
			Miter Sills		Normal Pool	Pas sill	Weir sill		
			Upper	Lower					
1	0.3	55 x 158	489.50	489.50	512.00	494.00	501.50	140	160
2	12.9	55 x 158	506.00	506.00	524.60	506.60	513.10	140	136
3	26.6	52 x 158	518.81	516.81	535.20	517.56	523.64	130	140
1 Tug	31.0	55 x 158	527.50	527.50	547.20	529.20	535.70	110	80
1 Levisa	35.4	55 x 158	526.50	526.50	546.20	528.20	554.70	110	96

Railroads.

The Chesapeake & Ohio Railroad.—This trunk line Railroad was completed to Huntington in 1873. It enters Cabell county at Culloden, in Teays Valley, and extends through Cabell and Wayne counties, a distance of about 30 miles, by way of Barboursville, Guyandot, Huntington, Ceredo and Kenova, and crosses the West Virginia and Kentucky boundary line at Kenova. It is double-tracked throughout this distance, having recently been practically relocated and reconstructed from St. Albans to Barboursville. The change reduced the curvature to a large extent and also diminished the grade to a maximum of sixteen feet to the mile.

The railroad has two branches, extending into the area under discussion: The Guyandot Valley Branch and the Coal River Railroad.

The Guyandot Valley Branch of the C. & O. R. R.—This Railroad extends from Barboursville up the Guyandot river to Mann at the mouth of Buffalo creek in Logan county. It was completed to Logan in 1904 and to Mann in 1911, extending through Cabell county for about fifteen miles, and through Lincoln county a distance of thirty-five miles. It is largely a coal carrying road, being the outlet to the great coal fields of Logan and Lincoln counties.

The Coal River Railroad.—This Railroad leaves the Chesapeake & Ohio Railroad at St. Albans and extends to Sproul, where it branches, one line extending up Big Coal river to Seth at the mouth of Laurel creek and the other branch extending up Little Coal river to Clothier, and from thence up Laurel creek, branching again, one branch extending up Seng creek and one branch extending up Laurel Fork of Spruce, both branches being in Logan county. It was constructed in 1905. The branch extending up Little Coal river enters Lincoln county near Bluetom Tunnel, and runs through the county for a distance of nine miles.

The Norfolk & Western Railroad.—The Ohio extension of the Norfolk & Western Railroad from Elkhorn, W. Va., to Coal Grove, Ohio, was begun in March, 1890, and opened for traffic on November 1, 1892. This road enters Wayne county at Kenova, extending up Twelvepole creek for a distance of 56.5 miles where it crosses the Wayne-Mingo line, going on by way of Dingess and Naugatuck, on Tug river, eastward to Norfolk, Va.

The Big Sandy Line of the Norfolk & Western Railroad was opened for traffic on December 15, 1904. This line continues up Big Sandy river from Kenova and connects with the Twelvepole division at Naugatuck. It was constructed to eliminate the sharp curves, and heavy grades on Twelvepole, and it shortens the distance from Kenova to Naugatuck 24.41 miles. However, the Twelvepole division is used as the eastbound track for empty coal cars, while the Big Sandy

Line is used by the loaded cars westbound. The length of the Big Sandy Line from Kenova to the Wayne-Mingo line is 52.5 miles.

The Baltimore & Ohio Railroad, Ohio River Division.—This railroad, extending from Wheeling to Kenova, was completed to Huntington in April, 1888, and to Kenova in 1890. The railroad extends from Kenova through Cabell and Wayne counties for a distance of about 28 miles.

The Camden Interurban Electric Railroad.—This electric line connects Huntington and Ashland by way of Kenova and was constructed in 1895.

Turnpikes.

The Guyandot and Charleston Turnpike was built in 1850 from Charleston on the south side of the Kanawha river to Scary, and thence through the Teays Valley by way of Milton and Barboursville, and was an extension from Charleston of the Giles, Fayette, and Kanawha Turnpikes to Guyandot.

GENERAL DESCRIPTION.

CABELL COUNTY.

Cabell is the most northern of the counties described in this report and is bounded on the north by the Ohio river and Mason county; on the east by Mason, Putnam and Lincoln counties; on the south by Lincoln and Wayne counties, and on the west by Wayne county and the Ohio river.

The area given by districts as carefully computed by the writer from the new and accurate topographic maps of the U. S. Geological Survey is as follows:

Districts.	Sq. Miles.
Barboursville	27.53
Grant	74.86
Guyandot	35.33
McComas	57.02
Union	77.03
Total.....	271.77

Cabell county varies in elevation from 494 feet above tide at the mouth of Four Pole, low water of the Ohio, to 1165 feet above tide at the summit of a high knob located near the southern part of the county, south 35° , west four and three-fourths miles from Salt Rock.

The population in 1900 was 29,252, classified as follows: whites, 27,713; negroes, 1,537; foreign born, 378, and the census of 1910 gives the population, 46,685.

The approximate mean magnetic declination in 1900 was $0^{\circ} 10' W$; mean annual change $+03'$, approximately; the mean annual rainfall is from 40 to 50 inches, and mean annual temperature 50° to 55° .

Cabell county was formed from part of Kanawha county in 1809 and was named in honor of William H. Cabell, Governor of Virginia in 1805. The following was the original description of its limits:

"Beginning at the corner of Mason county in Teays Valley, thence a direct line to the mouth of the Spruce Fork of Coal river, thence up said fork to where the line of Giles county crosses it, thence with the said line to Tazwell county line and with said line to the Tug Fork of Sandy, and down the same to its conflux with Ohio river, thence up the same to the mouth of Little Guyandot, in the county of Mason, and with the Mason line to the beginning."

Wayne county was afterwards formed from Cabell, and later Boone county took a portion of Cabell, and finally when Lincoln county was formed, another portion was cut off of Cabell. The late Hon. Virgil A. Lewis, State Archivist, gives the following in regard to its organization:

"The first Circuit Superior Court held in Cabell county, convened at the house of William Merritt, in April, 1809. Judge Coulter sat as judge. He came from the eastern part of the State for the purpose of holding the court, but upon his arrival was informed by the people that they did not need any court, and furthermore, that they did not want to be bothered with warrants, fines, judgments, etc. But the Judge believing that as Civil Government extended, so extended civilization, proceeded to open Court, and appointed Edmund Morris, clerk of the same. James Wilson qualified as attor-

ney and was appointed prosecutor. Then David Cartmill, Henry Hunter, Wm. H. Cavendish, John Mathews, Ballard Smith, Lewis Summers and Sylvester Woodward, attorneys of the State, were granted permission to practice in the Court. Of these, Lewis Summers was for many years one of the most able jurists of Virginia, and Sylvester Woodward, who had served as the first State's Attorney of Mason county, afterwards removed to New York and became Attorney General of that State." (Virgil A. Lewis' History of West Virginia, page 627).

The Ohio river forms the northwest boundary line for about 25 miles and the Guyandot flows through the county and empties into the Ohio at Guyandotte; Mud river flows through Lincoln and Cabell counties and empties into the Guyandot at Barboursville. All these rivers form wide and fertile bottoms, which are unsurpassed for agriculture and grazing purposes. The hills are neither high nor steep, and are covered with red clay soil mixed with limestone nodules: they form excellent grazing lands. The principal products of the county are corn, wheat, oats, rye, hay, potatoes, garden vegetables, apples, peaches, melons, tobacco, dairy products, beef cattle, sheep, poultry and hogs.

The quality and character of the soil products, as well as the mineral wealth in the line of coal, oil and gas, will be taken up in a separate chapter of this report.

The State Auditor, Hon. J. S. Darst, gives the following valuations in Cabell county for the year 1911:

	Assessed Valuation.	State Tax.
Real Estate.....	\$15,802,220.00	\$ 7,908.96
Personal Property...	6,403,770.00	3,644.66
Totals.....	\$22,205,990.00	\$11,553.62

The assessed valuation of the real estate in Cabell county is more than double that of Lincoln and Wayne counties combined.

There is no State tax assessed for school purposes. Each district makes its own assessment for maintenance of schools, both teachers and building fund.

Cabell county holds the second largest city in the State,

according to the census of 1910, and contains several other important towns. The larger of these are Milton, Barboursville, Guyandotte and Culloden.

Huntington.

Huntington is located on the Ohio river and is the county seat of Cabell county. It was incorporated under the title of "The City of Huntington" by an act of the Legislature, passed February 27, 1871, and named in honor of C. P. Huntington, the great financier, who was largely instrumental in building the Chesapeake & Ohio Railroad through West Virginia. The first election of corporate officers occurred on the first Thursday of September, 1871. In 1900 it had a population of less than 12,000, while in 1910 it had passed the 31,000 mark. This phenomenal growth has been due largely to its natural and geographical situation. Being located as it is between the mouths of two large rivers, on the gently rolling terraces of the Ohio river and at the terminus of the Teays Valley, it is a natural distributing point for many miles around both by water and rail. Owing to its geographical situation, the surrounding mineral and agricultural resources and its enterprising citizens, it has become the second city in West Virginia and bids fair to be the leading one between Pittsburgh and Cincinnati. The city has excellent free schools and Marshall College is located within its limits.

Marshall College.

More than 70 years ago a log cabin used for school and church purposes stood on the present site of Marshall College. Mr. Peck was the first teacher and was later assisted by Mr. Shepherd. Later through the untiring efforts of John Laidley, funds for a new building were secured, an acre and a fourth of land was purchased, a four story building erected, and trustees were appointed for same. In 1838 the institution was named in honor of Chief Justice John Marshall, "Marshall Academy". In 1858 the Legislature of Virginia changed the name from Marshall Academy to Marshall College.

A short time after the Civil War, the State of West Virginia made it a State Normal School, controlled by a State Board of Regents. Then new grounds were bought and the college greatly enlarged. There have been a number of able men at the head of the Institution, among whom is Prof. Thomas E. Hodges, now President of the West Virginia University, who was principal for ten years. The present head of the school is President L. J. Corbly, and through his able administration the Institution has grown rapidly until it has an enrollment of about 1100 students. Hon. Champ Clark, now Speaker of the House of Representatives, was once President of Marshall College.

West Virginia Asylum.

The West Virginia Asylum is located on a beautiful 30-acre site, donated to the State of West Virginia by the Chamber of Commerce of Huntington, among the foot hills of the eastern edge of Huntington and connected to the main part of the city by an electric car line, and was formerly known as "The Home for Incurables". It was established in 1897 by an Act of the Legislature, and in 1901 changed to the present name by an Act of the Legislature.

Building No. 1 was constructed of pressed brick at a cost of \$45,000 and is used for male patients, having a capacity of 150. Building No. 2 is a two-story building constructed of common brick and was the original "Home for Incurables", but is now used for aged women and children. In 1906 another story was added to the main building and a two-story annex and basement were added to the rear of same, at an entire cost of \$22,000. Building No. 3 was constructed of pressed brick at a cost of \$45,000 and is used for female patients, having a capacity of 150. Building No. 4 was constructed of pressed brick at a cost of \$50,000 and is the temporary administration building.

In 1904 the kitchen building, constructed of common brick, equipped with a ten-ton refrigerator ice plant, was completed and equipped at a total cost of \$21,000. The laundry, constructed of common brick together with equipment, cost

about \$10,000. The power house is similar in construction to the laundry and is equipped with a 250-horse power duplicate system of electric generators and one pump with a capacity of 1,000 gallons of water per minute. This building with equipment cost approximately \$12,000.

Water for the Asylum is obtained from two deep wells near the power house, pumped by deep well electric pumps. Dr. L. V. Guthrie is Superintendent of the Institution.

Huntington has nine banks with a capital stock of \$1,420,140.00 and deposits of \$4,246,290.00 (July 1st, 1912), thirty-six churches, fifteen hotels, twenty-four general stores and five wholesale groceries.

The following partial list of the business houses was furnished by Mr. H. E. Mathews, Secretary of the Chamber of Commerce of Huntington:

American Car & Foundry Co.	Swan Printing & Stationery Co.
Jarvis Huntington Auto Co.	Advertiser Printing Co.
Huntington Stove & Foundry Co.	Huntington Broom Works.
West Virginia Rail Co.	Sears & Carter Carriage Works.
Ligett & Myers Tobacco Co.	Columbia Gas Stove Company.
Hughes Ellis Boyd Tobacco Co.	General Waterproofing Co.
American Tobacco Co.	Cox Cut Glass Company.
Peytona Lumber Co.	Huntington Seating Co.
Prin Table Co.	East End Manufacturing Co.
Specialty Mattress Co.	Wilson Company.
F. C. McCollm Granite Co.	Huntington Tobacco Warehouse Co.
Huntington Sash, Door & Trim. Co.	H. E. Spilman & Co.
Lock Manufacturing Co.	J. R. Taylor Co.
West Virginia Foundry & Stove Co.	R. J. Reynolds Tobacco Co.
Morrow Planing Mill.	Empire Furniture Co.
Wilson Sand Company.	Huntington Chair Co.
Sliger Brothers.	Nicholson Kendle Furniture Co.
Abbott & Company.	Peerless Overall Factory.
Huntington Tumbler Co.	Sixteenth Street Mill.
Central City Bung Co.	Morris Machine Co.
Q. M. Calloway Lumber Co.	Huff Wagon Works.
Beader Box Company.	Huntington Milling Co.
W. Va. Paving & Pressed Brick Co.	Newberry Shoe Company.
Wyllie China Company.	Central Veneer Company.
Huntington Spring Bed Co.	Standard Printing & Pub. Co.
Huntington Handle Company.	Huntington Sand & Gravel Co.
West Virginia Brewing Co.	Superior Lumber Co.
Haury Bending Co.	Ashland Paint Company.
Ackerman Lumber Company.	Dreadnaught Chemical Co.
Huntington Red Brick Co.	Huntington Engineering & Mach.
Huntington Roofing Tile Co.	Co.
Chesapeake & Ohio Railroad Shops.	Huff Carriage Works.
Altizer Burchett & Co.	

Milton.

Milton, located on Mud river in Teays Valley, was laid off and incorporated as a town in 1872, and named in honor of Milton Reece, one of the first settlers in that neighborhood. It has been a center for the Milton Oil Field, and contains some manufacturing plants.

Milton has one bank, eight general stores, one drug store, one furniture store, one harness store, one hardware store, four restaurants, two blacksmith shops, one grist mill, two livery stables and one brick plant. It has also one graded high school and four churches. The population in 1900 was 582 and in 1910, 837.

Culloden.

The town of Culloden is located in the eastern part of Cabell county on the Chesapeake & Ohio Railroad in Teays Valley. It contains three stores, two churches, one school and one broom factory. The population in 1900 was about 200 and in 1910 the same.

Barboursville.

Barboursville is located on the Guyandot river at the mouth of Mud, about 10 miles east of Huntington. It was the first county seat of Cabell, being incorporated in 1867. It contains eleven stores, four churches, two hotels, one livery barn, one bank, one graded school for whites and one school for colored. It has a brick manufacturing plant, making a fine quality of building brick, and employing about 30 men. It has a tannery established in 1847 and is still tanning hides by the method used fifty years ago. It has one weekly newspaper, "The Barboursville Budget". The population in 1900 was 429, and 968 in 1910. Morris Harvey College was established here in 1888 and is under the control of the M. E. Church South.

Guyandotte.

Just how the name Guyandot originated does not seem to be known. One tradition has it that a French Indian trader explored and perhaps settled at the mouth of Guyandot and that the town was named for him, but it appears to be a generally accepted tradition that it originated from "Wyandot", the name of the Indian tribe that originally occupied this section. The Indian pronunciation of "Wyandot" and our pronunciation of "Guyandot" being very similar, it is supposed that Thomas Buffington, one of the first settlers in his attempts to say "Wyandot" originated the name "Guyandot", since the place was known as the "Mouth of Guyandot" for a long while after his settling there in 1775. It was long called the "Mouth of Guyandot" and was a terminus for a half century of a great cross country stage coach line, which ceased to be of use after the Chesapeake & Ohio Railroad line was constructed through this part of the State. Later it was changed to Guyandotte. The town was established on the land of Thomas Buffington in 1810 by legislative enactment. It was incorporated in 1849, also in the same year the Guyandot Navigation Company was formed and later built Locks and Dams in the Guyandot river, which made possible the transportation of lumber at all seasons of the year. The town continued to grow and prosper and in early times was known as the best town on the Ohio river. Thomas Buffington owned and operated a ferry across the Guyandot and Ohio rivers for many years.

In 1861, when Col. Zeigler of the U. S. A. burned the business portion of the town, together with a number of residences, the town received a blow from which it has never fully recovered. In 1911 it was made a part of Huntington and named East Huntington.

Guyandotte, or East Huntington, has 19 stores, 1 hotel, 1 restaurant, 1 printing shop, 1 saw and planing mill, 2 seat factories, 1 gas engine factory and 1 livery stable.

LINCOLN COUNTY.

Lincoln county adjoins Cabell county on the south and

is bounded on the east by Putnam, Kanawha and Boone counties; on the south by Boone, Logan and Wayne, and on the west by Wayne and Cabell counties.

The area given by magisterial districts, as carefully computed by the writer from the new and accurate maps of the U. S. Geological Survey, is as follows:

Districts.	Sq. Miles.
Carroll	67.50
Duval	58.95
Harts Creek	91.79
Jefferson	48.85
Laurel Hill	66.50
Sheridan	48.70
Union	30.71
Washington	35.76
<hr/>	
Total.....	448.76

Lincoln county varies in elevation from 535 feet above tide at the intersection of Guyandot river with the Lincoln-Cabell line, one mile and a half north of West Hamlin, to over 1500 feet on the summit of a high knob near the southern end of the county in Harts Creek district, one mile and a half northeast of Rector Postoffice, or a range in elevation of 965 feet. The population in 1900 was 15,434, of which 15,371 were white, 63 negro and 7 foreign born. The total population in 1910 was 20,491. The Mean Magnetic Declination in 1898 was $1^{\circ} 32'$ W. with a Mean Annual Change of approximately $+03$. The Mean Annual Rainfall is 40 to 50 inches and the Mean Annual Temperature, 50° to 55° .

Lincoln county was the third county formed after the organization of the new State of West Virginia. It was formed by an Act of the Legislature passed February 23, 1867, establishing the county of Lincoln out of parts of Cabell, Putnam, Kanawha and Boone counties. The county was named Lincoln in honor of Abraham Lincoln, the sixteenth President of the United States. The late Hon. Virgil A. Lewis, State Archivist, gives the following in regard to its organization:

"The first meeting of the Board of Supervisors was held on the 11th day of March, 1867, in what was known as Hamlin Chapel, an old church which stood on the Curry Farm, about one-fourth mile above the present county seat. There were present: William C. Mahone of Carroll District, John Scites of Sheridan and William A. Holstein of Duval District. William C. Mahone was made president and Benjamin F. Curry, Clerk, the latter giving the bond to the penalty of \$2000.00 with James A. Holly and Jeremiah Witcher as his sureties. Hamlin, the county seat, was named in honor of Hannibal Hamlin, vice-president when the county was formed." (Virgil A. Lewis' History of West Virginia, page 730).

The following is the original description given as its boundary lines: "Beginning at the old ford of Mud river, about two hundred yards below the mouth of Trace Fork of said river, thence with the dividing ridge between Trace creek and Little Buffalo creek, to the dividing ridge between Bear creek, Trace creek and Tyler creek to Guyandot river, at the mouth of Madison's creek, thence south forty-five degrees, west to the Wayne county line, thence with said line to the Logan county line, thence with said line to the Boone county line; thence with the original line of Cabell county to the head of Big creek, a branch of Mud river, thence along the top of the ridge above said creek to a point opposite the ford above the farm of Mark Adkins; thence crossing at said ford and along the top of the ridge below Parcener creek to the head of Horse creek; thence with the dividing ridge between the waters of Mud and Coal rivers and the waters of Big Hurricane creek, to and with the dividing ridge between the Trace Fork of Mud river, Charley's creek and Little Two Mile creek, to the place of beginning."

Guyandot river flows through the western portion of the county, forming wide bottoms, but these are sandy and form only fairly good agricultural soils.

Mud river flows through the middle of the county, forming some very good bottom land. The county is mostly rough and hilly, and is not so very well adapted to agricultural pursuits, but forms excellent grazing lands.

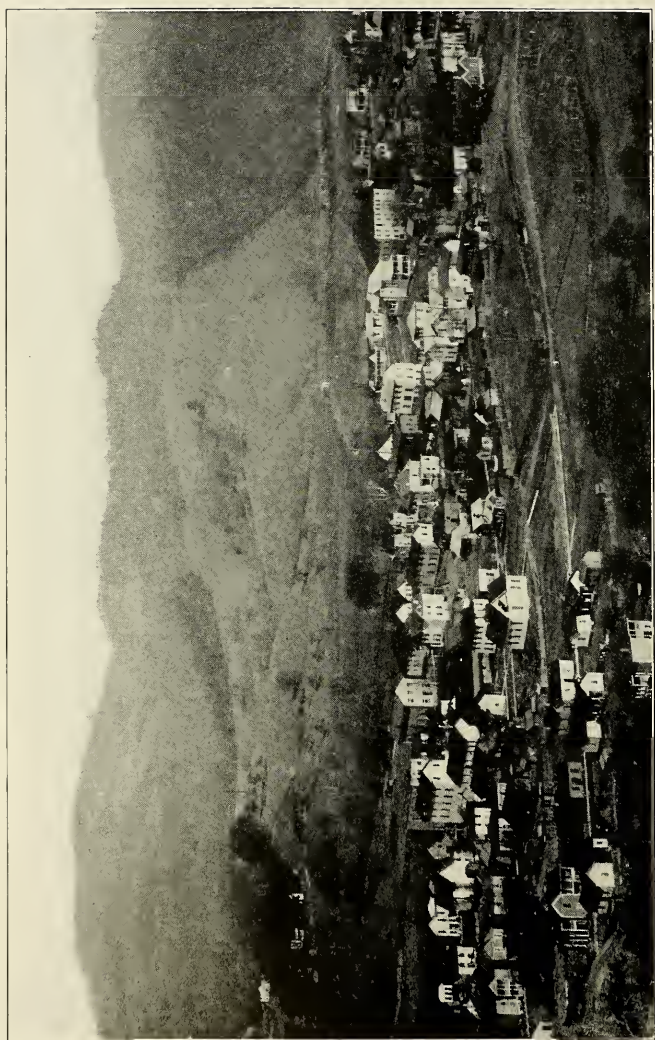


PLATE II.—Birdseye View of Hamlin, W. Va., Conemaugh Series

The principal products are corn, tobacco, wheat, oats, rye, hay, potatoes, garden vegetables, apples, peaches, melons, dairy products, beef cattle, sheep, poultry, petroleum, natural gas and coal.

The quality and character of the soil and its products as well as the mineral wealth in the line of coal, oil and gas, will be taken up in a separate chapter of this report.

The State Auditor, Hon. J. S. Darst, gives the following valuations in Lincoln county for the year 1910 and 1911:

	Assessed Valuation.	State Tax.
Real Estate.....	\$3,951,080.00	\$1,900.41
Personal Property	3,575,119.00	1,789.15
	<hr/>	<hr/>
Totals.....	\$7,526,199.00	\$3,689.56

The assessed valuation of the real estate in Lincoln county is only about one-fourth that of Cabell, while its personal assessed valuation is more than one-half that of Cabell county. There is no State tax assessed for school purposes. Each district makes its own assessments for the maintenance of its schools, both teachers and building fund.

There are no large towns located in Lincoln county; a few small towns are scattered over the county and they are all well supplied with churches and schools. The most important towns are Hamlin, Griffithsville, Branchland, West Hamlin, Yawkey, MacCorkle, Midkiff, Ranger, Latin, Gill, Eden Park and Brown City.

Hamlin.

Hamlin is the county seat and is located on Mud river in the northern part of the county. It is located on the second and third terrace above the river and was incorporated in 1908. It has 1 bank, 3 churches, 7 stores, 4 hotels and a graded school. The Eureka Pipe Line Company has located a pumping station at this place for pumping the petroleum through its lines northeastward to market.

Griffithsville.

Griffithsville is located on the headwaters of Middle Fork of Mud river, and was named Griffithsville in honor of Alexander Griffith, who was one of the first owners of the land at that point. A postoffice was established in the year 1855. It is located just west of the Griffithsville oil field. It has 1 bank, 2 churches, 1 school, 2 hotels, 5 stores, and a population of about 200 people. It is not incorporated. When the oil field was in the height of its development the town contained nearly 800 inhabitants.

Yawkey.

Yawkey is an oil town, located in the heart of the Griffithsville oil field, about two miles and a half east of Griffithsville. It was named in honor of Hon. Wm. H. Yawkey, one of the officers of the Big Creek Development Company, the largest individual operating company in that field. The postoffice was established in 1909. The town contains 2 stores, 2 hotels, 1 church, 2 school houses, and is the headquarters for the Big Creek Development Company. It is not incorporated, but has a population of about 400. When the oil field was in the height of development the town contained probably 1,000 inhabitants.

Branchland.

Branchland is an incorporated mining and oil town, located on the Guyandot river about 24.4 miles south of Barboursville, as measured along the Guyandot Valley Branch Railroad. It was first called Hadley in honor of Mr. Hadley, who opened mines here in 1902 and 1903. Then the name was changed to Lincoln, but another station on the Coal River Railroad was called by that name, and as this was confusing to both places, the town was called Branchland in honor of Col. Jos. R. Branch, who is now operating the mines there. It has 5 general stores, 1 church, 1 school, 2 hotels, and the population in 1910 was about 350. Coal was first

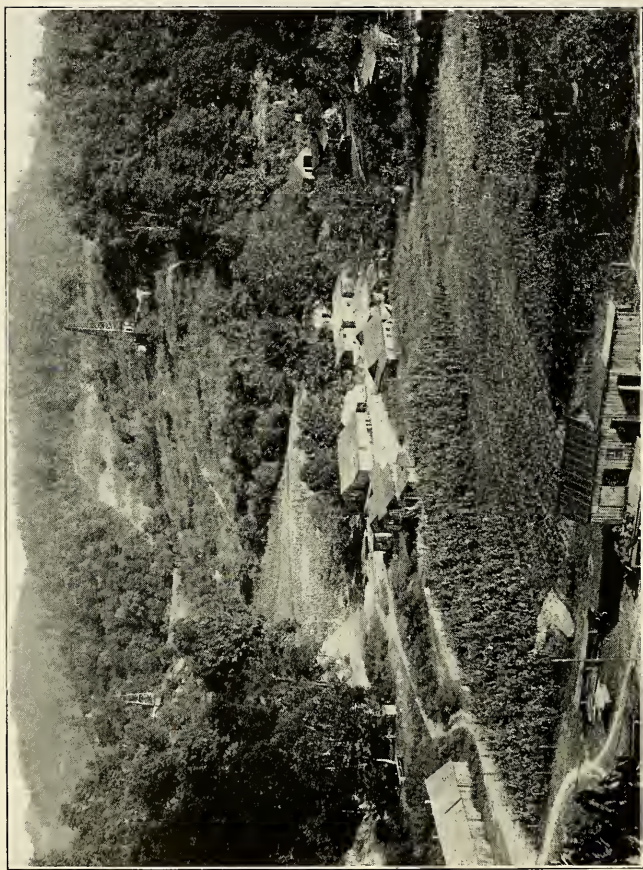


PLATE III.—Amy, Lincoln County.

mined on a commercial scale here in 1855, and shipped down the Guyandot river to the Ohio in flat boats.

MacCorkle.

McCorkle is located on Little Coal river at the mouth of Cobbs creek and was named in honor of Hon. Wm. A. MacCorkle, the ninth Governor of West Virginia. It has been the shipping point for the larger part of the supplies used in the Griffithsville oil field. It has 3 general stores, 2 hotels, 1 livery stable and 1 school. It is not incorporated and had a population in 1910 of about 100.

West Hamlin.

West Hamlin is located on the Guyandot river, and is 17.4 miles south of Barboursville, as measured along the Guyandot Valley Railway. It is the shipping point for Hamlin, and contained in 1910 a population of about 175. It has 5 stores, 2 churches, 1 school house and 1 hotel. It also contains a large ware house for collecting and shipping tobacco.

All the other towns are small shipping points along the railroad, or cross road villages, generally distributing points for mail and mail supplies.

WAYNE COUNTY.

Wayne county adjoins Cabell and Lincoln counties on the west and is the most western county in the State. It is bounded on the north by the Ohio river and Cabell county, on the east by Cabell, Lincoln and Mingo counties, on the south by Mingo county and Kentucky and on the west by Kentucky. It was named in honor of General Anthony Wayne, a general in the Revolutionary War.

Its area given by magisterial districts, as carefully computed by the writer from the new and accurate maps of the U. S. Geological Survey, is as follows:

Districts.	Square Miles.
Butler	90.50
Ceredo	52.45
Grant	78.79
Lincoln	128.17
Stonewall	76.62
Union	94.29
Total.....	520.82

Wayne county varies in elevation from 490 feet above tide low water at the mouth of Big Sandy river to 1500 feet on the highest summits near the southern end of the county, or a range in elevation of 910 feet. The late Hon. Virgil A. Lewis, State Archivist, gives the following interesting history of Wayne county:

"The first court held for the county of Wayne convened on the 11th day of April, 1842, at the house of Abraham Trout, Sr., who resided on the spot where Trouts Hill, the county seat, now stands. There were present the following justices: John Williams, Lewis McCormack, John Plymale, Samuel Webb, William Ratliff, Thomas Copley and Walter Owens. Hugh Bowen was elected Clerk of the Court for the term of nine years. John Laidley, William McComas, Joseph J. Mansfield, James H. Ferguson, Elisha McComas, attorneys of the State, were granted permission to practice in the County Court. John Laidley was elected commonwealth attorney."

"The first Survey.—The first land survey made within the present limits of the county was that of a tract of 28,627 acres, including the Ohio river bottoms immediately above the mouth of Big Sandy river. It was surveyed by George Washington in October, 1770, as bounty lands for Captain John Savage and the men composing his company for service done in the French and Indian War. The grant was made in compliance with the proclamation of Robert Dinwiddie, Governor of Virginia, in 1754, and the Savage Patent was signed by John, Earl of Dunmore, December 15th, 1772. (Virgil A. Lewis' History of West Virginia, page 682).

Wayne county was formed from Cabell in January, 1842, and its original boundary lines are given as follows:

"Beginning at the mouth of Fourpole creek on the Ohio river, thence a straight line to the mouth of Long Branch (so as to include the house and farm of Sas Booten within the new county); thence following the top of the dividing ridge between the said Long Branch, and the Beech Fork of Twelvepole river, up to the mouth of Raccoon creek, thence crossing the Raccoon creek to the dividing ridge between the said Beech Fork and Gyandot river, thence along the said dividing ridge to the line dividing the counties of Logan and Cabell, thence with said line to the mouth of Marrowbone creek, a branch of the Tug Fork of Big Sandy river, thence down said Big Sandy river, with the line dividing this State from Kentucky, to the mouth of Big Sandy river, thence up the Ohio river to the place of beginning."

In 1900 the county had a population of 23,619, of which 23,298 were white, 321 negro and 51 foreign born. The census report for 1910 gives the total population as 24,081. The Mean Magnetic Declination in 1898 was $1^{\circ} 11'$ West, and the approximate mean annual change is $+03'$ at Dunlow, and at Wayne Court House the Mean Magnetic Declination for 1898 was $0^{\circ} 45'$ West and the approximate mean annual change was $+03'$.

The northern half of Wayne county is excellent grazing land as also the tops of the ridges in the southern part of the county, being covered with red, limy shales. The bottom lands along the Ohio river on the north and those along Big Sandy river on the west are well adapted for agriculture. Also the bottom lands along Twelvepole creek as far south as Wayne Court House. The principal products are corn, wheat, oats, rye, hay, potatoes, tobacco, melons, garden vegetables, apples, peaches, beef cattle, sheep, poultry, lumber, natural gas, and coal. The quality and character of the soil and its products, as well as the mineral wealth, will be discussed in subsequent chapters of this report.

The State Auditor, Hon. J. S. Darst, gives the following values for the property of Wayne county for the year 1911:

	Assessed Valuation.	State Tax.
Real Estate.....	\$4,052,515.00	\$2,032.16
Personal Property.....	1,739,667.00	868.48
	<hr/>	<hr/>
Totals.....	\$5,792,182.00	\$2,900.64

The real estate valuation of Wayne county is a little over one-fourth as much as that of Cabell county, and a little more than that of Lincoln county, while the personal property valuation is only one-half as much as that of Lincoln county, and about one-fourth as much as that of Cabell county.

No State tax is assessed for school purposes. Each district makes its own assessment for the maintenance of schools, both teachers and building fund.

There are no large cities in Wayne county. The following are the principal towns: Wayne, Ceredo, Kenova, Fort Gay (Cassville), East Lynn, Dunlow, Webb, Crum, Stonecoal, Buffalo, Dickson, Echo, Genoa, Furguson and Wilsondale.

Wayne.

Wayne is the county seat of Wayne county and is located on a terrace overlooking Twelvepole creek, near the center of the county. This town was first called Trout Hill, and was named in honor of Abraham Trout, who was owner of the land. The town was incorporated by an order of the court, made June 21, 1882. Its name was changed later to Fairview and finally, in 1911, changed again to its present name. Its population in 1900 was 407, and 384 in 1910. It has 1 bank, a graded school, 7 stores, 2 hotels, 1 drug store and 3 churches. It derives its support principally from the farming districts and from the N. & W. Railroad.

Ceredo.

Ceredo is located on the Ohio river bottom, about 2 miles east of the mouth of Big Sandy river. It was founded in 1857 by Eli Thayer, a member of Congress from Massachusetts

and named by him Ceredo in honor of the fabled Goddess Ceres, on account of the bountiful crops of grain. He had hoped to make a manufacturing city out of it, but the Civil War coming on shortly after its formation thwarted his plans.

The town was incorporated February 23, 1866. It has 5 stores, 1 bank, 2 hotels, 1 newspaper, 3 churches, 1 graded school, 1 livery barn, and 1 saw mill. Its population in 1900 was 1,279, and 1,215 in 1910.

Kenova.

Kenova is located on the Ohio river bottom, west of the mouth of the Big Sandy river. It was founded about 1880 by a Philadelphia corporation known as the Kenova Land Association. Possibly the first settler where Kenova now stands was Stephen Kelley, who came to the mouth of Big Sandy and built his cabin in 1798. Kenova has several industrial plants, among which are: 1 wire mill, 1 chemical plant, 1 band mill, 1 veneering mill, 1 box factory, 1 wholesale grocery, 1 wholesale lumber company, 6 stores, 2 schools, 2 churches, 1 bank, and 2 hotels. Its population in 1900 was 863, and 992 in 1910. Kenova being located at the junction of Ohio, Kentucky, and West Virginia, was named from a portion of the abbreviations of each of the three States.

Fort Gay (Cassville).

Fort Gay is located on the Big Sandy river, at the junction of Tug and Louisa Forks. It was incorporated about 1850 under the name of Cassville. When the Big Sandy river line of the Norfolk and Western Railroad was completed, its name was changed to Fort Gay. During the Civil War a fort, known as Fort Gay, had been erected on the Kentucky side just opposite the town from whence it takes its name. It has 7 stores, 3 hotels, 1 graded school, and 4 churches. Its population in 1910 was 457. The town derives its support from the railroad and the farming region of the surrounding country.

Dunlow.

Dunlow is located on Twelvepole creek near the southern end of Wayne county. The town has 1 hotel, 2 stores, 1 school, 1 church, and the population in 1910 was about 100. It was formerly a mining village, but the mines have been abandoned, and it now derives its support from the railroad, and is a shipping point for lumber and supplies for the farmers.

East Lynn.

East Lynn is located five miles southeast from Wayne on the waters of East Fork of Twelvepole. It is a mining town, being the headquarters of the East Lynn Coal Company. It is incorporated and has 7 stores, 2 small grist mills, 1 handle factory, 1 graded school, but no church. It has a population of about 300.

Stonecoal.

Stonecoal is located on the Ohio extension of the Norfolk and Western Railroad, about 50 miles east of Kenova. It contains 1 store and the manufacturing plant of the Meteor Carbon Factory in which Carbon Black is manufactured.

The other towns in the county are small places, having one or two stores and a post-office. Those on the railroad are distributing points for passengers, supplies, and mail for the surrounding regions.



PLATE IV.—Ohio River, Looking West Near Cox Landing, Cabell County.

CHAPTER II.

THE PHYSIOGRAPHY OF THE CABELL-WAYNE-LINCOLN AREA.

To the ordinary observer, residing in the Cabell-Wayne-Lincoln area, "no physical change seems to be taking place in the general topography of the valleys and hills. They seem to be everlasting, yet these forms are constantly changing. The inorganic world, that is, the rocks that form the hills and mountains, grows old and conforms to the universal law of nature. All things in nature adjust themselves to the environment of their surrounding conditions. These changes are constantly taking place though they are not appreciable to the untrained eye."

"The atmosphere with its changing temperature, its evaporation and precipitation, its electrical force and effect; streams of running water both on the surface and underground, all combine to make up the engraving tools that erode and disintegrate the rock and start it on its ceaseless march to the sea to find its final resting place."

"The studies of the geologist reveal the apparent fact that the Appalachian area was reduced to a peneplain in cretaceous time, and re-elevated to be reduced to a second peneplain during the tertiary period, again to be elevated at the close of the tertiary period, and at the present time is being reduced to a third peneplain." The different life periods of the land forms have been discussed by the writer in the Jackson-Mason-Putnam Report of the Survey, to which the reader is referred for a description of same. The general history of rivers has also been given in the same volume.

The course of a river and its topographic history may sometimes be influenced by some unusual forces, which constitute "geologic accidents". This was the case in the history of the North American Continent during the Quarternary period, when the northern areas were covered with an ice sheet

of wide extent and thickness. This large body of ice moved slowly southward and formed dams across the beds of rivers. This resulted in great ponds and inland lakes. These ponds or inland lakes overflowed at some low point in the enclosing valley walls. Then erosion would take place and new channels would be formed, which often continued when the barrier of ice was melted.

The great northern glacier, which moved across Ohio, had a great effect upon the drainage area of the Cabell-Wayne-Lincoln area. The most interesting result in the recent geologic history in the area under discussion, is the change in the course of the Kanawha river from west to north, resulting in the complete evacuation of its old channel along Teays Valley. This valley has long been known to be an abandoned river channel, and different reasons have been assigned for explanation of the change of the stream which formerly occupied it, and to give some plausible reason for the deposits of clay found therein. The most prominent of these suggestions is the one which assumes that the present Ohio river drainage was dammed by the northern ice sheet during the Glacial epoch, since the readjustments appear to be closely and indirectly related to it.

Teays Valley is only one of similar features that exist within 100 miles of the southern limits of the Glacial area. According to Dr. F. H. Knowlton, the Monongahela river clay corresponding to the clay of Teays Valley, has produced fossil plants, which belong to the Glacial flora. While these abandoned channels appear to be due to conditions which were general throughout the Ohio Valley, yet their relation to the surrounding topography, the variation at different places, the different character of sediment deposited in them, and the difference in height to which these deposits extend, all indicate that local and special conditions may have entered into each separate case.

The formation of local ice dams by the river breaking up occasionally is about the only hypothesis which appears to satisfy the existing conditions. In order to bring about the changes of the river to a new course, the dam must have been of sufficient height to raise the water to a considerable height

above its former level. The climate must have been severe enough to hold such a dam for a time long enough from season to season until the ponded water corroded a new way around the obstruction. This channel would have to be cut to a depth below the level of the silt, which had accumulated on the rocky floor of the former channel. This is also the conclusion of Mr. M. R. Campbell of the U. S. G. Survey.

To apply this hypothesis to Teays Valley it would be necessary to suppose that a dam of this kind occurred in the vicinity of Ashland, Ky., by which the stream was forced to abandon its valley back of Russell and to seek a new channel further north by Ironton where the present Ohio river is located.

Below such a dam or barrier no deposition of sediments would be found, for after the formation of this dam the valley has not been occupied by either standing water or by streams of any consequence. The water above this barrier, while ponded to such an extent as to cause it to drop most of its load of fine material, was still affected by currents, so that the material so deposited was rudely stratified and arranged in such a manner as the flood plain deposits of the present large streams. Back of the city of Ashland in Kentucky is a district known as Flatwoods, where the hills are flat and do not rise to an altitude of 700 feet above tide. These flat lands are covered with a deposit of sand and gravel, quartz and chert boulders, some of which are twelve inches in diameter, being the same formation found in the Teays Valley. These represent residual material from the remains of older crystalline rocks of the Blue Ridge Mountains to the east. Also the chert boulders have possibly come from the Black Flint Ledge, which is a prominent formation along Kanawha river from Charleston to the mouth of Gauley river. At Charleston it occurs at the level of the Chesapeake & Ohio Railroad, and at Gauley Bridge it outcrops near the top of the highest hills. This gravel deposit can be traced fairly distinctly up Big Sandy river to a point near Fort Gay, maintaining its general elevation of about 150 feet above the present flood plain of the stream.

It is also more than probable that another dam or barrier

of ice was formed in the vicinity of Milton, and that this barrier was so high and strong that it backed the water up to the level of the divide on the northern side of the valley, across which the stream with its several outlets overflowed into the present valley of the Kanawha river. Three channels appear to have been formed to carry off the overflow of the submerged valley. The present course of the Kanawha river was one of these lines of discharge, while the other two were located farther west in the valleys of Big and Little Hurricane creeks.

The most eastern channel appears to have been the most favorable location, and the stream was turned to its present course in that channel while the other two outlets by way of Hurricane creek were abandoned. Large deposits of silt and laminated clay were deposited in the eastern end of Teays Valley, and especially is this true in the vicinity of Culloden. and also between Scott Depot and Scary. The writer found this laminated silt at an elevation of 760 feet, or 180 feet above the rock bed of the valley, one mile northeast of Scott Depot.

The Teays Valley is covered with deposits of finely laminated clay, sand, gravel, quartz and chert boulders, some of which are more than two feet in length. These materials represent the residual matter from the remains of older Crystalline rocks that have come from the Blue Ridge Mountains from the east. The Black Flint Ledge, a prominent stratum in the Kanawha Valley, south of Charleston, has doubtless furnished the chert boulders, which have been carried into this valley.

The Chesapeake & Ohio Railroad has recently graded a new double track road bed from St. Albans through Teays Valley to Barboursville. The Teays formation can be readily traced in the railroad cuts through the valley. The deposit is about 680 feet above tide at Scary or about 140 feet above the present low water in the Kanawha river. This deposit can be traced through the entire valley and varies very little in the elevation from Scary to Barboursville. This Teays formation appears on the hills south of Guyandot river between Barboursville and Huntington, and along the public road between these points, the gravel, sand and boulder deposit is readily

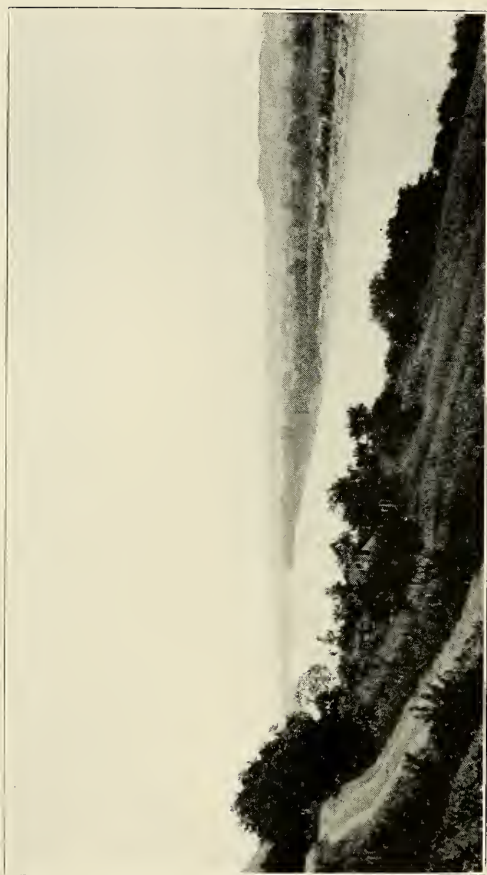


PLATE V.—Ohio River, South of Cox Landing, Cabell County.

traced. Recently in making an excavation for the new addition to the building of the Home for Incurables at Huntington, this deposit was encountered.

DESCRIPTION OF DRAINAGE BASINS.

The drainage of this area is carried off either directly or indirectly by the Ohio river, which bounds it on the north.

The principal tributaries are the Guyandot river, Big Sandy river, Mud river, Twelvepole, Fourpole creek and Guyan creek.

The Ohio River.

The Ohio river, formed by the junction of the Allegheny and Monongahela rivers, flows in a general southwestern direction, emptying into the Mississippi at Cairo, Ill., 967 miles from its origin at Pittsburgh, Pa. It falls from 700 feet above tide at Pittsburgh to 275 feet at Cairo, or 425 feet, giving a descent of a little more than 5 inches per mile. This fall is, however, irregular, and the river bed presents an interesting series of shoals and rapids, or riffles, separated by pools. The water is deeper in these pools, and the fall is very gentle, being at the rate of 1" to 2" per mile. In the riffles, or rapids, the usual fall is nearly 2 feet per mile. At Letart Falls the descent is 3' 2" in less than one mile. The fall of the Ohio from Point Pleasant pool to the pool made by Lock No. 29, 3 miles below the mouth of Big Sandy river, is 21 feet, or from 524.5 feet above tide at Point Pleasant to 503.5 feet above tide at the mouth of Big Sandy river.

The Congress of the United States has recently made appropriations for the purpose of constructing Locks and Dams in the Ohio river from Cairo to Pittsburgh. One of these Locks, No. 28, is located at Huntington and is now under construction. Lock No. 27, located 4 miles above the mouth of Guyandot, is not yet built. The low water elevation of the Ohio at Huntington, before Lock No. 28 was built, was 494 feet, while the high water tidal elevation is 551 feet, a difference of 55 feet. The principal tributaries of the Ohio river

in the Cabell-Wayne-Lincoln area, beginning at Kenova and going up stream are as follows: **Twelvepole, Fourpole creek, Guyandot river, Sevenmile creek, Ninemile creek, Gooserun and Guyan creek.**

The Guyandot River.

The Guyandot river takes its source near the Flat Top Mountains in Raleigh county, where it is formed by the junction of Winding Gulf, Stonecoal, Tommy and Devil's Fork creeks, and flows in a general southwestern direction through Raleigh, Wyoming, Logan, Lincoln and Cabell counties, emptying into the Ohio river at Guyandot. Its entire length is 170 miles and its fall from its source to its mouth is 1105 feet, or from 1600 feet above tide at Stonecoal Junction to 495 feet at the Ohio river. The greatest descent of the river is in the first fifty miles of its length, or from Stonecoal Junction to Gilbert, the fall for this distance being about 780 feet. This river is a very crooked stream, since the air line distance from its source to its mouth is only 82 miles—less than one-half its meandering distance. It flows 34 miles through Lincoln county and 28 miles through Cabell.

The waters of Guyandot have long been utilized in floating log rafts and loose logs from its head waters to its mouth. In the past twenty years many million feet of valuable timber have thus been transported to market. It was also used as early as 1853 for transporting coal down to the Ohio from Branchland. Freight was transported for years on this river in small boats propelled by men with "push poles" where the water was not too deep, and rowed where the water was too deep for poles. In the Summer season, when the water was low, mules were used to propel these boats through the rapids or shoals. But since the construction of the Guyandot Division of the Chesapeake & Ohio Railroad to Logan, river transportation has practically been abandoned.

The principal tributaries of the Guyandot river in the area under discussion are as follows:

Russell creek, Davis creek, Booten branch, Mill creek, Heath creek, Merritt creek, Smith creek, Cavill creek, Tom



PLATE VI.—Guyandot River Valley Looking East from a Point Near Wilson Station.

creek, Trace creek, Tyler creek, Madison creek, Twomile creek, Bear creek, Falls creek, Mile creek, Fourmile creek, Six Mile creek, Nine Mile creek, Furnett creek, Fourteen Mile creek, Aaron creek, Hamilton creek, Little Ugly creek, Big Ugly creek, Sand creek, Little Hart creek, Hart creek, Green Shoals branch and Limestone branch.

Mud River.

As already stated, a portion of the channel of Mud river is of recent geologic formation. Mud river was one of the tributaries of the Kanawha when it flowed through Teays Valley; and after the course of the Kanawha was deflected from Teays Valley at St. Albans to its present course, the drainage of Teays Valley was taken up by Mud river. This river enters the valley near Milton and flows through it to Barboursville, where it empties into the Guyandot river.

This channel meanders much and the character of its flow is very sluggish, since it has very little fall for the last 20 miles of its length. The river probably derived its name from the fact that its waters are always muddy, owing to the alluvial deposits along its banks. It rises in the western portion of Boone county and flows in a general northwest direction. Its length from its source to its mouth is 77 miles and the fall is 328 feet, the descent of the first 10 miles being 128 feet. It flows for 43 miles through Lincoln county and has an average fall of 5.4 feet per mile. Its length through Cabell county is 31 miles, while its fall is only 2.2 feet per mile. It has a great many tributaries, among which are the following: Merrick creek, Little Cabell creek, Cyrus creek, Fudge creek, Cabell creek, Edmonds branch, Lower creek, Mill creek, Dry creek, John branch, Indian creek, Charley creek, Two Mile creek, Little Trace creek, Trace creek, Buffalo creek, Laurel creek, Middle fork, Mahone creek, Lower Big creek, Little Laurel creek, Laurel creek, Fez creek, Upper Big creek, Parsner branch, Left fork, Upton branch, Bear branch, Berry branch, Connelly branch, and Stanley fork.

Middle Fork.

Middle fork of Mud river has its source at the junction of Straight fork and Sugartree fork in Duval district, Lincoln county and flows in a northwestern direction into Mud river about two miles below Hamlin. Its length is 8 miles and its fall is 38 feet.

Twelvepole Creek, or River.

This stream takes its source at the base of Guyan Mountain in Mingo county and flows in a general northwest direction and empties into the Ohio river near Ceredo. The stream derived its name from the fact that the surveyors when locating the Savage land grant at its mouth in 1784, found its width to be twelve poles, or rods. It is the only large stream in the State having its source within the Ohio Valley section. The main Twelvepole is formed by the junction of **East** and **West** forks about 1 mile south of Wayne. Its length from this junction to its mouth is 31 miles and the fall of its highest flood plain is from 695 feet above tide at its junction to 555 feet at its mouth, a difference in elevation of 140 feet. This gives it a gradient of about 4.55 feet per mile, which is greater than that of the Big Sandy of the Guyandot.

The principal tributaries of Twelvepole are as follows: Walker branch, Bobs branch, Buffalo creek, Haynes branch, Plymale branch, Newcomb creek, Camp creek, Beech fork, Lynn creek, Big creek, Garrett creek, Toms creek, East fork, and West fork.

Beech Fork of Twelvepole.

Beech fork has its source in Stonewall district, Wayne county, and flows in a general northern direction to Winslow, where it turns and flows in a western direction into Twelvepole creek just above Lavelette. Its length is $28\frac{1}{2}$ miles and its fall is 585 feet. The greatest fall is in the first 2 miles, which is 345 feet.

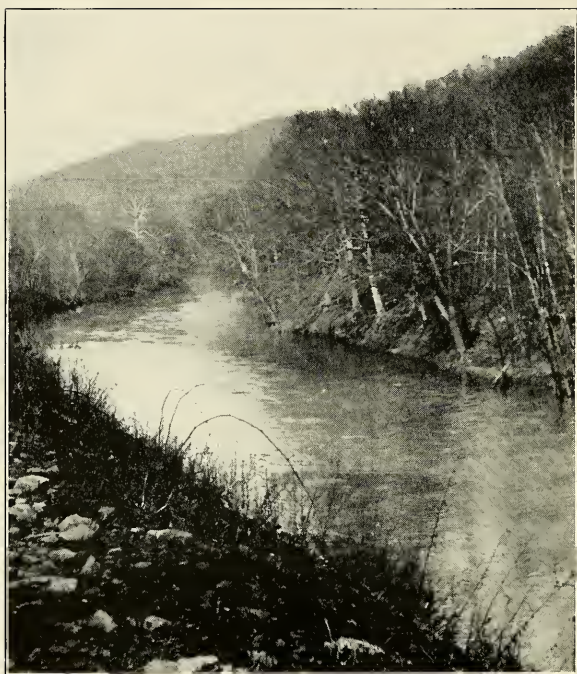


PLATE VII.—Scene Along Coal River, near Sproul.

East Fork of Twelvepole.

East fork has its source in the northern part of Mingo county, and flows in a northwestern direction $11\frac{1}{2}$ miles through Mingo county, $1\frac{1}{2}$ miles through Lincoln county, and 22 miles through Wayne county, emptying into Twelve pole about 1 mile south of Wayne Court House. Its entire length is 35 miles and its fall in the first 12 miles is 890 feet, and in the remaining 23 miles is but 180 feet.

The principal tributaries of the East fork of Twelvepole creek are as follows: Two Mile creek, Newcomb creek, Petercove branch, Little Lynn creek, Camp creek, Lynn creek, Laurel creek, Brushy creek, Lick creek, Rich creek, Beechy branch, Cove creek, Bluelick branch, Kiah creek, Milam creek, McComas branch, Crane Nest branch and Copen fork.

West Fork of Twelvepole.

The West fork of Twelvepole creek has its source in the northern part of Mingo county and flows in a northwestern direction for 15 miles across that county, passing through the corner of Mingo and Lincoln, and for 36 miles through Wayne county, emptying into Twelvepole about 1 mile south of Wayne. Its entire length is 52 miles and its fall in the first 15 miles is 776 feet, and in the remaining 36 miles is only 260 feet, thus making the rate of fall per mile in the last 36 miles 7.2 feet.

The principal tributaries of the West fork of Twelvepole in the area under discussion are as follows: Patrick creek, Trace fork, Joels branch, Sycamore branch, Flat branch, Billy branch, Ferguson branch, Big branch, Missouri branch, Moses creek, Long branch and Turkey creek.

Big Sandy River.

Big Sandy river is formed by the junction of Tug fork and Louisa fork at Louisa, Ky., and empties into the Ohio at Kenova. Its length is 27 miles and its fall is 24 feet.

The principal tributaries of the Big Sandy river on the

West Virginia side are as follows: Miller creek, Dock creek, Sharps branch, Whites creek, Grayston creek, Elijah creek, Hurricane creek, Little Hurricane creek and Tabor creek.

Tug Fork of Big Sandy River.

Tug fork of Big Sandy river takes its source in Tazwell county, Virginia, and flows in a general northwestern direction through McDowell county, and forms the boundary line between West Virginia and Kentucky. Its length is about 126 miles, and its fall is more than 2200 feet. It is a very rapid stream, a series of rapids or falls extending over several miles and known as "The Roughs of Tug", being one of the most remarkable regions in the State. At these rapids in 1757, a detachment of Virginia troops lost their supplies by the wrecking of their canoes and boats on an expedition against the Indians north of the Ohio.

The principal tributaries of Tug fork of the Big Sandy river on the West Virginia side in the Cabell-Wayne-Lincoln area are as follows: Mill creek, Powdermill branch, Lost creek, Horse creek, Drag creek, Camp creek, Bull creek, Silver creek, Jennie creek, Stonecoal branch and Marrowbone creek.

TOPOGRAPHY OF THE LAND.

The Cabell-Wayne-Lincoln area is a high dissected plateau from 800 to 1500 feet above tide. Water erosion has reduced this original plateau all to slope, the streams following in deeply cut "V" shaped valleys. Numerous ridges and hills ranging in elevation from 800 to 1500 feet above sea level, capped with the most resistant layer of sandstone and rock strata, remain as evidence.

The Guyandot river has cut a deep gorge through the middle portion of the area, from one-fourth to one-half mile wide and from 400 to 800 feet deep. The Big Sandy river with its Tug River fork has cut a deep gorge along the western boundary of the area from one-eighth to one mile wide. Mud river has cut a deep gorge through the eastern part of

the area. The valley walls are usually steep and rough, and particularly is this true in the southern part of the area.

The present flood plains of the different rivers, in the southern part of the area, are represented by narrow strips of sandy bottom land along the shore, that widen out first on one side and then on the other. The flood plains in the northern portion of the area are wider strips of fertile bottom lands, ranging from 500 to 3000 feet in width, located first on one side and then on the other of the streams.

River Terraces.

River terraces are found along the Ohio river from Glenwood to Kenova. The different classes of terraces have already been described by the writer in the detailed report on the Jackson-Mason-Putnam area.

Kenova, Ceredo and Huntington are all built upon the second terrace.

The terraces that occur along the Big Sandy, Guyandot and Twelvepole, and Mud rivers correspond very closely to those along the Ohio river.

The flood plain of the Ohio river ranges from 550 feet above tide where it leaves the area at Kenova to 580 feet where it enters from the east at the Cabell-Mason county line, showing a gradient of about one foot per mile. The flood plain of Big Sandy river has an elevation of about 597 feet at Fort Gay and 550 feet at its mouth, showing a gradient of about 1.1 foot per mile.

The flood plain at Guyandot river has an elevation of about 630 feet above tide at the south, where it crosses the Logan-Lincoln county line, and about 565 feet at its mouth, showing a gradient of less than one foot per mile. This is slightly less than the gradient of Big Sandy or the Ohio.

PART II.

The Geology of the Cabell-Wayne-Lincoln Area.

CHAPTER III.

GENERAL GEOLOGY OF THE AREA.

The outcropping stratified rocks of the Cabell-Wayne-Lincoln area are included wholly in the Upper Carboniferous, and the exposed beds extend from the Dunkard series through the Monongahela, Conemaugh, Allegheny and a portion of the Upper Pottsville or Kanawha series. The following table illustrates the subdivision of the stratified rocks to be described in this area:

TABLE OF GEOLOGICAL FORMATIONS IN WEST VIRGINIA.

UPPER CARBONIFEROUS.

Dunkard or Permo-Carboniferous Series (1100 to 1200 feet).

Monongahela Series (260 to 400 feet).

Conemaugh Series (500 to 600 feet).

Allegheny Series (225 to 350 feet).

Pottsville Series (250 to 2000 feet).

LOWER CARBONIFEROUS.

Mauch Chunk Red Shales (40 to 250 feet).

Greenbrier Limestone (50 to 300 feet).

Pocono Sandstones (400 to 600 feet).

DEVONIAN.

Catskill Sandstones (Venango Oil Group, 300 to 500 feet).

Chemung, Portage and Hamilton, 1000 feet thick, to the Corniferous Limestone penetrated in the Central City well at a depth of 2760 feet, but thickening to over 2000 feet in the deep well near Griffithsville, 25 miles southeast, and to 2840 feet near Coalburg, Kanawha county, in the Wm. Seymour Edwards deep well on Slaughter creek.

Some general sections will now be given illustrating the order and character of the several formations in the Cabell-Wayne-Lincoln area, as shown by the outcropping rocks and the records of the borings for oil, gas, and coal.

CABELL COUNTY SECTIONS.

The abbreviations used in this report are as follows: A. T. = above mean tide level of the Atlantic ocean; the letters A. T. L. mean that the elevation given was made with the "Y" level instrument and is approximately accurate; the letters A. T. B. mean that the elevation in question was made with the Aneroid Barometer carried from and checked up with some adjacent bench mark, and therefore may be all the way from 5 to 25 feet or more in error.

The following section was measured with hand level, descending into Long branch from the east, one mile east of Rich Knob, Grant district:

Long Branch Section, Grant District.

	Thickness	Total
	Feet.	Feet.
Dunkard Series (90')		
Sandstone	20	20
Red shales and concealed.....	20	40
Sandstone	15	55
Red shale.....	3	58

	Thickness Feet.	Total Feet.	
Sandstone, medium coarse grained, buff color, mica- ceous .....12'	Waynes- burg Sandstone	32	90
Limestone, impure, gray fossiliferous 3			
Sandstone, friable, buff color .....17			
} Sandstone			
Monongahela Series (245')			
Red shale.....	2	92	
Fire clay.....	1	93	
Dark red shale.....	8	101	
Sandstone and concealed.....	44	145	
Sandstone, friable.....	11	156	
Dark red shale.....	9	165	
Sandstone, conglomerate.....	36	201	
Red and sandy shale, mixed.....	49	250	
Sandstone, coarse grained, conglomerate.	58	308	
Sandy shale.....	6	314	
Sandstone, massive (Pittsburgh) 685' A. T.	21	335	245'

This section shows the Waynesburg sandstone broken up by a stratum of red shale and of impure gray limestone, and the Waynesburg coal absent. The Pittsburgh sandstone at the base of the section is coarse grained and conglomeratic.

The following section was measured with a hand-level descending the hill to the new Chesapeake & Ohio Railroad Station at Milton, Grant district:

Milton Section, Grant District.

	Thickness Feet.	Total Feet.	
Dunkard Series (65')			
Red shale.....	20	20	
Sandstone, massive, medium coarse- grained, Waynesburg	45	65	
Monongahela Series (301')			
Red shales.....	20	85	
Sandstone, massive, Gilboy.....	45	130	
Red shales.....	25	155	
Sandstone	35	190	
Red and sandy shales.....	30	220	
Sandstone, massive.....	60	280	
Sandy shale.....	27	307	
Sandstone	28	335	
Sandy and red shale, Pittsburgh.....	12	347	
Sandstone	3	350	
Red and sandy shale.....	14	364	
Blue shale, Pittsburgh coal horizon.....	2	366	301'
Sandstone	2	368	
Blue shale, to Railroad grade.....	2	370	

This section begins in the Dunkard series and shows the Waynesburg sandstone 45 feet thick, massive and medium coarse grained. The thickness of the Monongahela is shown to be 301 feet.

The following section was measured with aneroid, descending along the turnpike, one mile west of Proctorville, Lawrence county, and opposite the city of Huntington, Guyandot district:

Proctorville Section.

	Thickness Feet.	Total Feet.	
Monongahela Series (45')			
Concealed	5	5	
Sandstone, Pittsburgh.....	35	40	
Fire clay, Pittsburgh coal horizon.....	5	45	45'
Conemaugh Series (265')			
Sandy shale and concealed.....	25	70	
Sandstone, Lower Pittsburgh.....	23	93	
Red, limy shales.....	4	97	
Sandy shales.....	12	109	
Red, limy shales.....	4	113	
Sandstone	12	125	
Red shales.....	7	132	
Sandy shales.....	5	137	
Sandstone, massive.....	37	174	
Dark gray, limy shales, Clarksburg.....	3	177	
Red shales.....	5	182	
Sandy shales.....	5	187	
Sandstone, massive, Morgantown.....	51	238	
Coal and slate, Elk Lick.....	4	242	
Concealed to low water, Ohio river.....	68	310	265'

This section gives the interval between the Elk Lick and Pittsburgh coals, 197 feet. The Morgantown sandstone is massive and medium coarse grained and has reached a thickness of 51 feet.

The following section was measured with Aneroid north-west along the road leading from Bobs Branch, Ceredo district, Wayne county, to Central City, Guyandot district, Cabell county, and joined on to the Harvey well (C-144) located one mile southwest of Central City:

Central City Section, Guyandot District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (446')			
Sandstone	5	5	
Red, limy shales.....	45	50	
Sandstone, buff.....	20	70	
Red and sandy shale.....	25	95	
Sandstone, buff, medium coarse-grained..	25	120	
Sandy shale, Morgantown sandstone.....	13	133	
Fire clay and slate, Elk Lick coal.....	2	135	
Sandy shale and concealed.....	30	165	
Sandstone, flaggy.....	20	185	
Red and sandy shale.....	13	198	
Lime shale, dark yellowish, Upper Ames.	2	200	
Sandy shale.....	13	213	
Lime shale, Lower Ames.....	2	215	
Sandstone, coarse-grained, full of iron ore nuggets, Saltsburg.....	45	260	
Sandy shale and concealed.....	58	318	
Fire clay, Bakerstown coal horizon.....	2	320	
Sandstone, coarse-grained, Buffalo.....	38	358	
Fire clay.....	2	360	
Sandy shale.....	20	380	
Sandstone, Mahoning.....	40	420	
Top of Harvey well, 530' A. T.			
Conductor (clay and quicksand).....	26	446	446'
Allegheny Series (199')			
Shale, sand and lime.....	94	540	
Limestone	7	547	
Slate with layers of fire clay.....	98	645	199'
Pottsville Series (680')			
Sand, fine.....	25	670	
Slate	50	720	
Sand, gas.....	30	750	
Slate, black.....	10	760	
Sand, gray.....	60	820	
Slate, black.....	10	830	
Sand, gray.....	85	915	
Slate, white and blue.....	25	940	
Sand and limestone.....	20	960	
Slate	20	980	
Slate, black.....	175	1155	
Sand, gray.....	25	1180	
Slate, black-blue, coal 2 feet.....	105	1285	
Sand, gas and strong flow of salt water..	30	1315	
Sand, black.....	10	1325	680'
Mauch Chunk (65')			
Slate, black.....	30	1355	
Limestone	5	1360	
Slate, black.....	30	1390	65'
Greenbrier Limestone (150')			
Limestone, (Mountain).....	150	1540	150'
Pocono Sandstone (635)			
Slate	28	1568	
Sand, dark gray, some salt water, Big In- jun	177	1745	

	Thickness Feet.	Total Feet.	
Shales and slate, black.....	370	2115	
Limestone or hard sand.....	10	2125	
Slate, brown.....	25	2150	
Sand, (Berea, "salt and pepper") (oil and gas)	25	2175	635'
Catskill, Chemung and Hamilton Series (1005')			
Slate, black.....	10	2185	
Sand, hard gray.....	5	2190	
Limestone	5	2195	
Sand, gray.....	10	2205	
Limestone	3	2208	
Slate, black.....	2	2210	
Limestone, bastard.....	4	2214	
Shale, black.....	20	2234	
Sand, fine black, powdery.....	97	2331	
Shales and slates, black, blue, white.....	574	2905	
Limestone, bastard (gas).....	15	2920	
Shale	250	3170	
Sand, gray.....	10	3180	1005'
Corniferous Limestone, very hard.....	10	3190	

This is a very important section, in that it was until recently the deepest well drilled in the southwestern part of West Virginia, extending practically from the Pittsburgh coal horizon to the Corniferous limestone. The section begins about 70 feet under the Pittsburgh coal, and this gives the interval between the Pittsburgh coal and the top of the Berea sand 2245 feet, and the interval between the Pittsburgh coal and the Corniferous limestone, 2830 feet; also the interval between the Berea sand and the Corniferous limestone as 1005 feet. In the Bedell well near Pittsburgh the rocks were penetrated 4010 feet below the Berea sand without reaching the Corniferous horizon, but in the R. A. Geary well near McDonald, Penna., the Corniferous limestone was found at 6138 feet below the Pittsburgh coal and 4386 feet below the Berea Grit.

The interval between the Pittsburgh coal and the Berea has increased 543 feet from the Wagner well at Pt. Pleasant, Mason county, W. Va. This interval in the Kanawha Fruit Farm well No. 1 on Bill creek, Scott district, Putnam county, is 2233 feet. This well is located N 81° 30' W, 35 miles from the Harvey well.

The following section was measured with an aneroid in descending from Piney Mountain, and connected to the East End Land Company's Well No. 4.

Piney Mountain Section, Grant District.

	Thickness Feet.	Total Feet.	
Dunkard Series (44')			
Red shale.....	4	4	
Sandstone, coarse-grained, Waynesburg..	40	44	44'
Monongahela Series (291')			
Red shale and concealed.....	30	74	
Sandstone, (Gilboy).....	25	99	
Concealed to top of Well, Elev., 978' A. T.	28	127	
Conductor	16	143	
Red rock.....	39	182	
Lime	15	197	
Red rock.....	15	212	
Sand	25	237	
Red rock.....	20	257	
White slate.....	15	272	
Red rock.....	8	280	
Sand, Pittsburgh.....	55	335	291'
Conemaugh Series (507')			
Slate	72	407	
Sand	45	452	
Red rock.....	30	482	
White slate.....	25	507	
Sand	45	552	
Red rock.....	25	577	
Black slate.....	15	592	
Red rock.....	20	612	
Sand	10	622	
Red rock.....	30	652	
Sand	45	697	
Red rock.....	20	717	
Slate and red cave.....	40	757	
Lime	10	767	
Sand	15	782	
White slate.....	10	792	
Red rock.....	15	807	
White slate.....	35	842	507'
Allegheny Series (292')			
Lime shells.....	40	882	
Sand and water.....	240	1122	
Slate	12	1134	292'
Pottsville Series (681')			
"First" Cow Run sand.....	90	1224	
Slate	30	1254	
Lime	10	1264	
"Second" Cow Run sand.....	85	1349	
Slate	3	1352	
Sand and lime.....	109	1461	
Black slate.....	10	1471	
Sand	10	1481	
Salt sand.....	40	1521	
Salt sand.....	294	1815	681'
Mauch Chunk (10')			
Little lime.....	10	1825	10'
Greenbrier Limestone (232')			
Big lime.....	232	2057	232

	Thickness Feet.	Total Feet.
Pocono Sandstone (551')		
Big Injun sand.....	100	2157
Lime and sand.....	230	2387
Squaw sand.....	110	2497
Black slate and shells.....	84	2581
Sand	4	2585
White slate.....	6	2591
Berea sand.....	17	2608
Slate	3	2611

551'

This record begins in the Dunkard series and extends through the Pocono beds. It is interesting, in that it shows the thickening of the interval between the Pittsburgh coal horizon and the Berea sand from 1702 feet at Pt. Pleasant, W. Va., to 2273 feet, an increase of 571 feet in 28 miles.

The following section was measured with aneroid descending into Green Bottom along the road leading from Fairview School House, Union district:

Green Bottom Section, Union District.

	Thickness Feet.	Total Feet.
Monongahela Series (255')		
Sandstone	20	20
Red shales.....	10	30
Sandstone	11	41
Red and sandy shale.....	24	65
Sandstone	30	95
Sandy shale.....	15	110
Red shale.....	10	120
Sandstone	15	135
Sandy shale.....	6	141
Dark red shale.....	10	151
Sandstone	4	155
Red and sandy shale.....	10	165
Sandstone, friable.....	22	187
Red, limy shale, mixed with sand.....	16	203
Sandstone, massive, Pittsburgh.....	50	253
Fire clay, Pittsburgh coal horizon.....	2	255
Conemaugh Series (135')		
Sandstone, Lower Pittsburgh.....	28	283
Fire clay and coal, Little Pittsburgh coal horizon	2	285
Red shale	8	293
Limestone, dark gray, Pittsburgh.....	2	295
Red and sandy shale.....	15	310
Sandstone	55	365
Concealed to 505' A. T.....	15	390

255'

135'

This section starts near the base of the Dunkard series and gives the Monongahela series a thickness of 255 feet.

The following section was measured with hand-level, descending near Crown City Ferry, Union district:

Crown City Ferry Section, Union District.

	Thickness Feet.	Total Feet.	
Monongahela Series (234')			
Sandstone, coarse-grained.....	15	15	
Red shale.....	10	25	
Sandstone	15	40	
Sandy shale.....	5	45	
Red shale.....	10	55	
Sandy shale.....	5	60	
Sandstone, coarse-grained, full of lime concretions	35	95	
Sandy shale.....	19	114	
Red and sandy shale.....	21	135	
Sandstone, massive, full of quartz pebbles	40	175	
Red shale.....	2	177	
Fire clay.....	2	179	
Sandstone, massive.....	50	229	
Fire clay and coal, Pittsburgh.....	5	234	234'
Conemaugh Series (117')			
Sandstone, shaly.....	23	257	
Limestone, dark gray.....	2	259	
Red and sandy shale.....	22	281	
Sandstone, friable.....	23	304	
Limestone	2	306	
Red and sandy shale.....	20	326	
Concealed to B. & O. R. R., 569' A. T.....	25	351	117'

The following section was measured with aneroid, descending the hill, along the road east of Hodges, Guyandot district:

Hodges Section, Guyandot District.

	Thickness Feet.	Total Feet.	
Monongahela Series (121')			
Concealed and sandstone.....	25	25	
Sandy shale.....	10	35	
Red, limy shale.....	30	65	
Sandstone, friable.....	21	86	
Fire clay (Redstone coal horizon?).....	1	87	
Limestone and limy shale.....	3	90	
Sandstone, medium coarse-grained.....	10	100	
Red, limy shale.... 5' } Pittsburgh			
Sandstone, massive.15 } Sandstone	20	120	
Coal blossom, (Pittsburgh).....	1	121	121'
Conemaugh Series (194')			
Sandstone	14	135	

	Thickness Feet.	Total Feet.	
Limestone and limy shale.....	5	140	
Sandstone, massive, friable.....	28	168	
Sandy shale.....	5	173	
Sandstone, massive, (Connellsville).....	38	211	
Coal blossom, Clarksburg.....	1	212	
Sandstone, massive, friable, medium coarse-grained (Morgantown).....	43	255	
Red limy shale.....	2	257	
Sandstone, massive, friable (Grafton)...	13	270	
Red limy shale.....	5	275	
Sandstone, massive, reddish, to 700' A. T.	40	315	194'

This section shows the Pittsburgh sandstone broken up with a stratum of red limy shale, 5 feet thick. The Clarksburg coal makes its appearance with a mixture of coal and slate, one foot thick.

The following section was measured with aneroid, descending into Hollins branch, near Martha, Barboursville district:

Martha Section, Barboursville District.

	Thickness Feet.	Total Feet.	
Monongahela Series (187')			
Concealed	10	10	
Sandstone, massive, friable, coarse-grained	27	37	
Limy red shale.....	3	40	
Sandstone and concealed.....	40	80	
Concealed	10	90	
Red, limy shale.....	10	100	
Sandstone, massive, medium coarse- grained	38	138	
Sandy shale.....	10	148	
Sandstone	37	185	
Fire clay and coal (Pittsburgh).....	2	187	187'
Conemaugh Series (93')			
Sandstone and concealed.....	23	210	
Sandstone and concealed.....	33	243	
Sandy shale.....	5	248	
Sandstone and concealed to 690' A. T....	32	280	93'

The following section was measured with aneroid, descending along the road into Little Fudges creek from the west and is joined on to the Virginia Morrison well (C-133), Grant district:

Little Fudges Creek Section, Grant District.

	Thickness Feet.	Total Feet.	
Monongahela Series (250')			
Sandy shale and sandstone.....	50	50	
Dark red, limy shales.....	12	62	
Sandy shales.....	18	80	
Sandstone, friable, medium coarse-grained	35	115	
Red and sandy shale.....	15	130	
Dark red shale.....	15	145	
Sandstone, coarse-grained.....	55	200	
Red limy shales.....	15	215	
Sandstone.....	13	228	
Fire clay.....	2	230	
Sandstone and concealed.....	18	248	
Fire clay, Pittsburgh coal horizon.....	2	250	250'
Conemaugh Series (570')			
Sandy shale and concealed to top of Virginia Morrison Well, 680' A. T.....	70	320	
Gravel.....	14	334	
White sand.....	20	354	
Black slate.....	26	380	
Red rock.....	20	400	
White slate.....	10	410	
White sand.....	50	460	
White slate.....	110	570	
White sand.....	10	580	
White slate.....	100	680	
Red rock.....	40	720	
White slate.....	100	820	570'
Allegheny Series (215')			
Red rock.....	20	840	
White slate.....	130	970	
White sand.....	60	1030	
White slate.....	5	1035	215'
Pottsville Series (715')			
White sand.....	45	1080	
White slate.....	15	1095	
White sand.....	35	1130	
Black slate.....	70	1200	
White sand.....	60	1260	
Black slate.....	160	1420	
White sand.....	50	1470	
Black slate.....	50	1520	
Salt sand.....	230	1750	715'
Mauch Chunk (135')			
Little lime.....	20	1770	
Black slate.....	59	1829	
Black lime.....	35	1864	
White slate.....	10	1874	
Black lime.....	5	1879	
Pencil cave.....	6	1885	135'
Greenbrier Limestone (170')			
Big lime.....	135	2020	
Black slate.....	35	2055	170'

	Thickness Feet.	Total Feet.	
Pocono Sandstone (591')			
Black sandy shale.....	45	2100	
Big Injun sand.....	110	2210	
Slate	422	2632	
Berea sand.....	14	2646	
Slate to bottom.....	12	2658	603'

"Considerable salt water in Big Injun sand. Small showing of oil in Berea sand."

This section shows the interval between the Pittsburgh coal and the Berea sand to be 2382 feet, a thickening of the interval from the Central City section, given on page 59, of 137 feet. The Virginia Morrison well bears S 87° 30' E, 14 miles from the Harvey well in the Central City section.

The following section was measured with hand-level, descending hill from the south into the head of Little Two Mile creek, Grant district, Cabell county, and is joined on to the W. L. Rucker well No. 1 (C-14), drilled by the Coal River Oil & Gas Company.

Little Two Mile Creek Section, Grant District.

	Thickness Feet.	Total Feet.	
Monongahela Series (333')			
Red and sandy shale.....	55	55	
Sandstone, Gilboy.....	10	65	
Red and sandy shale.....	20	85	
Sandstone	17	102	
Sandy shale.....	31	133	
Sandstone	22	155	
Red shale with lime nodules.....	35	190	
Sandstone, Pittsburgh.....	23	213	
Concealed	120	333	333'
Conemaugh, Allegheny, Pottsville Series (1460')			
Sandstone, massive.....	16	349	
Concealed to top of W. L. Rucker well, 735' A. T.....	44	393	
Mud	14	407	
Sand	10	417	
Slate, blue.....	76	493	
Sand	25	518	
Slate, blue.....	125	643	
Sand	10	653	
Slate, blue.....	169	822	
Coal, (No. 5 Block?).....	3	825	
Slate, black.....	18	843	
Sand	10	853	
Slate, black.....	5	858	

	Thickness Feet.	Total Feet.	
Sand	35	893	
Slate, black.....	105	998	
Sand	40	1038	
Slate	105	1143	
Sand, hard.....	30	1173	
Slate	10	1183	
Sand	10	1193	
Slate	86	1279	
Sand	9	1288	
Slate	25	1313	
Sand	15	1328	
Slate	5	1333	
Lime	10	1343	
Slate	30	1373	
Salt sand.....	420	1793	1460'
Greenbrier Limestone (220')			
Big lime.....	165	1958	
Slate	55	2013	220'
Pocono Sandstones (543')			
Big Injun sand.....	80	2093	
Slate and shells.....	443	2536	
Berea Grit.....	20	2556	543'

The above section shows the interval between the bottom of the Pittsburgh sandstone and the top of the Berea sand to be 2343 feet, showing this interval gradually increasing toward the south.

The following section was measured with hand-level descending hill from the west into Charley creek, about 2 miles east of the mouth of Little Two Mile creek and is joined on to the R. C. Kilgore well No. 1 (C-40), Grant district:

Charley Creek Section, Grant District.

	Thickness Feet.	Total Feet.	
Monongahela Series (280')			
Concealed	25	25	
Sandstone	15	40	
Dark red and yellow shale.....	20	60	
Sandstone, massive.....	35	95	
Red and sandy shale.....	24	119	
Fire clay.....	1	120	
Sandstone, massive, coarse-grained, friable	20	140	
Reddish yellow, limy shale.....	35	175	
Sandstone, massive, buff colored.....	15	190	
Red and sandy shale, mixed.....	10	200	
Sandstone	15	215	
Sandy shale.....	10	225	
Sandstone, massive (Pittsburgh).....	55	280	280'

	Thickness Feet.	Total Feet.	
Conemaugh, Allegheny and Pottsville (1522')			
Concealed to top of boring, 610' A. T.	30	310	
Unrecorded	630	940	
Coal	6	946	
Sand and slate.....	374	1320	
Black slate and Salt sand.....	80	1400	
Salt sand.....	15	1415	
Salt sand (show of oil at 1574').....	387	1802	1574'
Greenbrier Limestone (158')			
Big lime.....	158	1960	158'
Pocono Sandstones (592')			
Top of Injun (gas).....	63	2023	
Injun sand.....	72	2095	
Slate and shells.....	434	2529	
Berea, gas.....	1	2530	
Berea sand.....	22	2552	592'
Total depth.....		2560	

The above section shows the interval between the bottom of the Pittsburgh sandstone and the top of the Berea sand to be 2250 feet.

The following section was measured with hand-level, descending hill on the east to Salt Rock, McComas district:

Salt Rock Section, McComas District.

	Thickness Feet.	Total Feet.
Conemaugh Series (395')		
Sandstone, massive, coarse-grained fer- riferous, Connellsville.....	45	45
Red and sandy shale.....	20	65
Limestone, impure, brecciated, magne- sian, Clarksburg.....	1	66
Sandstone, massive, conglomeratic, coarse grained, Morgantown.....	29	95
Sandy shale.....	25	120
Limestone, fairly pure, yellowish gray..	3	123
Sandstone, massive, flaggy, Grafton.....	45	168
Limestone, impure, yellowish (Upper Ames?)	2	170
Sandstone and concealed.....	33	203
Limestone, hard, rather pure, blue (Lower Ames?)	4	207
Red, limy shale, (Pittsburgh).....	22	229
Limestone, impure, yellowish.....	2	231
Sandstone, massive, medium coarse-grain- ed, buff, (Saltsburg).....	22	253
Sand shale.....	15	268
Limestone, impure, ferriferous.....	5	273
Sandy shale.....	26	299
Sandstone, massive, medium coarse grain- ed, iron ore nodules (Buffalo).....	49	348

	Thickness Feet.	Total Feet.
Sandy shale.....	9	357
Showing of coal, Brush Creek.....		
Sandstone, massive, buff color, medium grained, (Mahoning).....	36	393
Coal, slate and fire clay (Upper Free- port) at 595' A. T.....	2	395 395'

Roach is located $2\frac{3}{4}$ miles north of Salt Rock and in the Parkersburg Syncline. The strata dip very fast to the north between the two points.

The following section was taken with a hand-level at Roach, McComas district:

Roach Section, McComas District.

	Thickness Feet.	Total Feet.
Monongahela Series (99')		
Dark red shales with some lime nodules.	10	10
Sandy shale.....	5	15
Sandstone, massive, coarse-grained, con- glomeratic, Pittsburgh.....	80	95
Slate	1	96
Coal, crop badly weathered (Pittsburgh)	1.5	97.5
Fire clay.....	1.5	99 99'
Conemaugh Series (141')		
Sandstone, massive, Lower Pittsburg....	41	140
Fire clay, dark, (Little Pittsburgh coal horizon	2	142
Limestone and limy shale.....	3	145
Sandstone, flaggy, (Upper Connellsville)	40	185
Red shale.....	2	187
Sandstone, massive, (Lower Connellsville)	23	210
Red limy shale, (Clarksburg).....	10	220
Limy shale and concealed to 585' A. T...	20	240

The foregoing general sections, given at different points, illustrate the rock succession in Cabell county.

LINCOLN COUNTY SECTIONS.

A few scattered sections will now be given in Lincoln county.

The following section was measured with hand-level, descending hill from the north at Griffithsville, and joined on to the Serepta Workman well No. 1, drilled by the Big Creek Development Company.

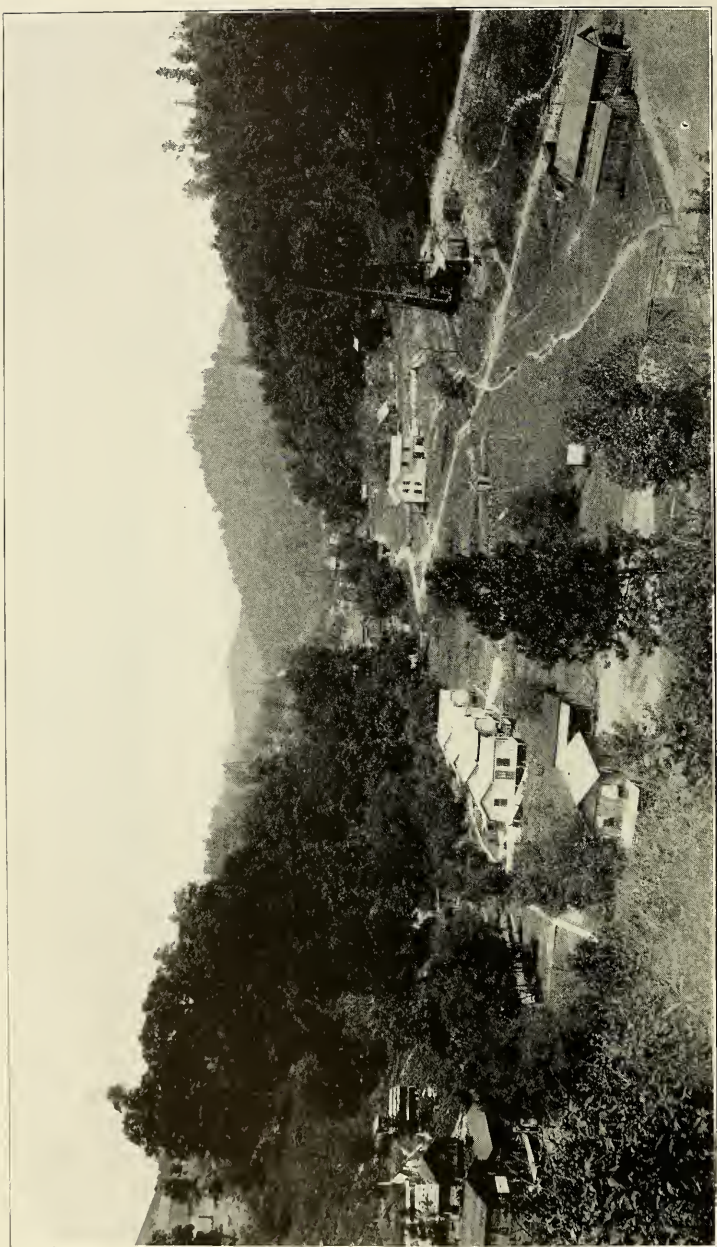


PLATE VIII.—Griffithsville Oil Field, Conemaugh Series, East of Griffithsville, Lincoln County

Griffithsville Section, Duval District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (450')			
Sandstone, coarse-grained, Lower Pitts-			
burgh)	31	31	
Sandy shale.....	10	41	
Sandstone, coarse-grained, (Upper Con-			
nellsville)	45	86	
Red shale	5	91	
Sandstone, Lower Connellsville.....	14	105	
Red and sandy shale and concealed.....	22	127	
Sandstone, fine-grained, flaggy (Morgan-			
town)	44	171	
Sandy shale and concealed.....	11	182	
Sandstone, Grafton.....	38	220	
Sandy shale and concealed.....	44	264	
Sandstone, coarse-grained, (Saltsburg)...	36	300	
Sandy shale.....	2	302	
Limestone, dark, impure.....	3	305	
Fire clay, (Bakerstown).....	2	307	
Sandstone, (Buffalo) nodules of iron ore..	49	356	
Sandy shale and concealed.....	10	366	
Limestone, impure yellowish (Brush			
Creek)	1	367	
Sandy shale	5	372	
Sandstone, Upper Mahoning, iron nodules	49	421	
Dark fire clay and slate, Mahoning.....	2	423	
Sandstone, medium coarse-grained, (Ma-			
honing)	25	448	
Slate	2	450	450'
Allegheny Series (218')			
Coal and slate, (Upper Freeport).....	3	453	
Sandstone, dark.....	17	470	
Concealed to top of boring at 665' A. T..	8	478	
Gravel and quick sand.....	40	518	
Slate and shells.....	50	568	
Sand	25	593	
Slate	10	603	
Sand	60	663	
Coal, Lower Kittanning, (North Coal-			
burg, No. 5 Block).....	5	668	218'
Kanawha Series (705')			
Sand, (Roaring Creek), top of Kanawha			
or Upper Pottsville.....	50	718	
Slate	10	728	
Sand	30	758	
Slate	10	768	
Sand	160	928	
Slate	125	1053	
Sand	25	1078	
Slate	100	1178	
Sand	25	1203	
Slate	60	1263	
"Gas" sand.....	110	1373	705'

	Thickness Feet.	Total Feet.	
Middle and Lower Pottsville Series (510')			
Salt water sand, having a "break" of slate 20 to 30 feet thick at 150 feet below top			
Middle and Lower Pottsville.....	510	1883	510'
Greenbrier Limestone (236')			
Big Lime, (Greenbrier).....	230	2113	
Red rock.....	6	2119	236'
Pocono Series (515')			
Big Injun sand, reddish.....	50	2169	
Slate	40	2209	
Limestone shells.....	150	2359	
Slate and shells.....	239	2598	
Slate, black.....	11	2609	
Sand, Berea, oil.....	25	2634	515'
Slate to bottom.....	2	2636	

This section begins only a few feet underneath the Pittsburgh coal horizon, and makes the interval between the Pittsburgh coal and the top of the Berea sand about 2650 feet instead of 2250 feet as along the Ohio river, thus showing a gradual increase of this interval in going to the southeast.

The following section was measured with aneroid descending the road at the extreme southern end of Curry district, Putnam county, just east of the Lincoln county line, and is joined on the Isaac Bayes well, located on the headwaters of Big creek. The record of the well was furnished by Messrs. Holly and Stephenson, Charleston, W. Va.

Big Creek Section, Curry District, Putnam County.

	Thickness Feet.	Total Feet.	
Monongahela Series (106')			
Sandstone, massive.....	28	28	
Red shale.....	13	41	
Sandstone, massive, (Pittsburgh).....	63	104	
Coal and fire clay (Pittsburgh).....	2	106	106
Conemaugh Series (518')			
Sandstone, Lower Pittsburgh.....	15	121	
Red shale, limestone nodules.....	45	166	
Sandstone, (Upper Connellsville).....	28	194	
Red shale.....	4	198	
Limestone	2	200	
Sandy shale.....	12	212	
Limestone	1	213	
Sandy shale.....	8	221	
Sandstone, (Lower Connellsville).....	34	255	
Sandy shale.....	2	257	
Limy shale and limestone, (Clarksburg)..	3	260	
Red shale	10	270	

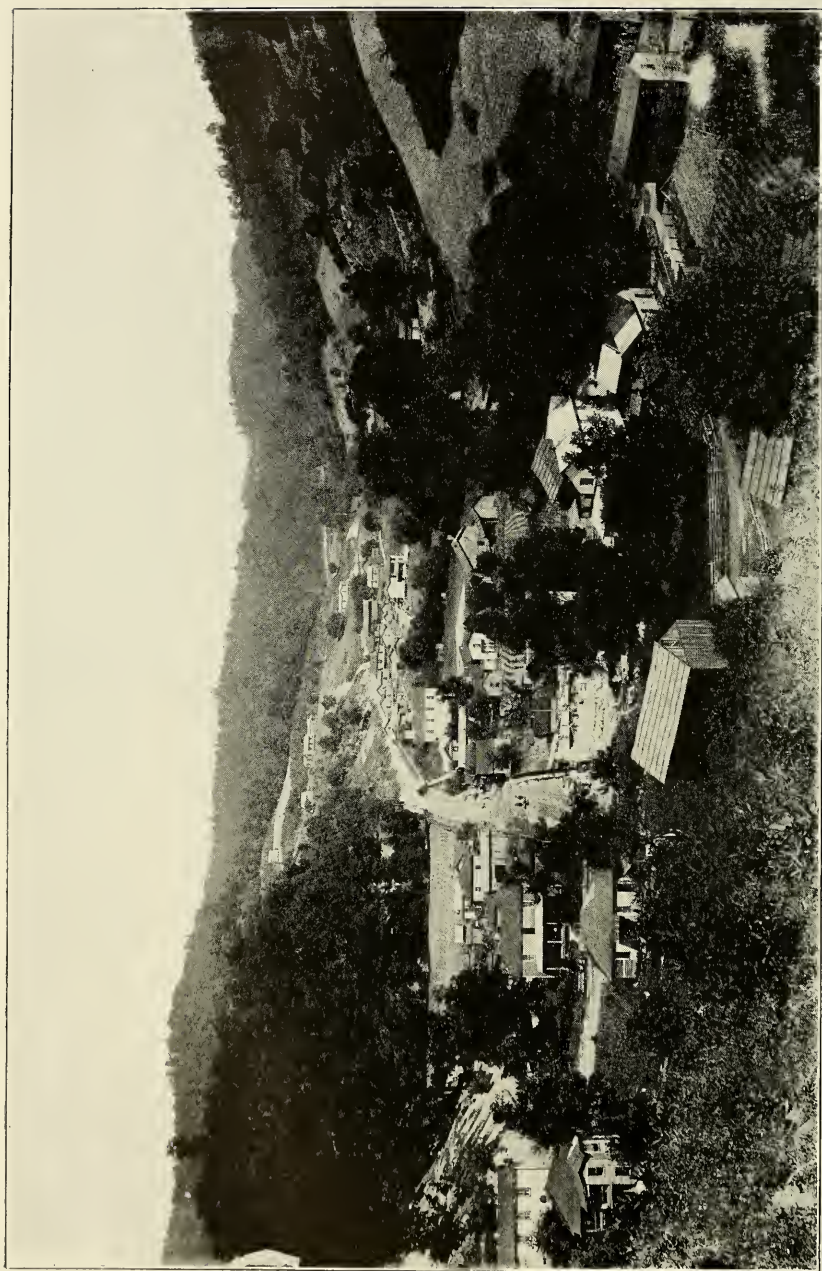


PLATE IX.—Griffithsville, Looking East, Conemaugh Series.

	Thickness Feet.	Total Feet.	
Sandy shale.....	5	275	
Red shale.....	4	279	
Sandy shale.....	10	289	
Sandstone	5	294	
Red shale.....	1	295	
Fire clay.....	2	297	
Red shale.....	9	306	
Limestone, yellowish, and yellow shale..	3	309	
Sandstone to top of boring.....	5	314	
Soil and gravel.....	22	336	
Slate	138	474	
Sand	35	509	
Slate	40	549	
Sand	75	624	518'
Allegheny Series (220')			
Slate	85	709	
Sand	15	724	
Slate	120	844	220'
Pottsville Series (955')			
Sand, (Roaring Creek), salt water at 864'	40	884	
Slate	55	939	
Sand	20	959	
Slate	71	1030	
Sand	30	1060	
Slate	85	1145	
Sand	55	1200	
Slate	35	1235	
Sand	70	1305	
Sand, salt water at 1485'.....	494	1799	955'
Greenbrier Limestone (230')			
Big Lime.....	220	2019	
Slate	10	2029	
Pocono Sandstones (493')			
Big Injun sand.....	20	2049	
Slate and shells.....	180	2229	
Slate, black.....	277	2506	
Berea sand.....	16	2522	493'

The above shows a large thickening of the Pottsville series from the region of the Ohio river, since in the Central City well, page 38, the Pottsville is only 680' thick. Coal beds appear to be entirely absent from the underground measures.

The following hand-leveled section was taken descending the hill from the south of Porter creek, Duval district, 1 mile east of Amy, and is joined to the M. A. and T. A. Griffith well No. 11 (L-195), drilled by the Big Creek Development Company.

Porter Creek Section, Duval District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (490')			
Sandstone, fine-grained, buff, friable, (Lower Pittsburgh Sandstone).....	27	27	
Sandy shale and concealed.....	33	60	
Red, limy shale.....	5	65	
Sandstone, sandy shale and concealed...	30	95	
Light red shale.....	2	97	
Sandstone, massive, coarse-grained, buff, ferriferous (Connellsville).....	55	152	
Dark red shale, lime nodules (Clarksburg)	10	162	
Sandstone, flaggy and sandy shale (Mor- gantown)	70	232	
Sandy shale.....	13	245	
Sandstone, flaggy, fine-grained, (Grafton)	30	275	
Sandy shale.....	16	291	
Red, limy shale (Ames horizon).....	4	295	
Red and sandy shale.....	34	329	
Sandstone, massive, coarse-grained, buff (Saltsburg)	50	379	
Light sandy shale.....	11	390	
Sandstone, massive, grayish buff, mica- ceous, (Buffalo).....	25	415	
Fire clay, (Brush Creek coal).....	1	416	
Sandy shale.....	9	425	
Sandstone, massive and flaggy, ferri- ferous	29	454	
Sandy shale.....	21	475	
Sandstone, massive, (Mahoning).....	15	490	490'
Allegheny, Kanawha and Pottsville Series (1440')			
Dark, limy shale (Upper Freeport coal horizon)	3	493	
Sandy shale	10	503	
Sandstone, medium coarse-grained, gray, buff, conglomerate	13	516	
Blue, slaty formation.....	1	517	
Sandstone, coarse-grained, in bed of Por- ter creek and top of boring, 705' A. T..	3	520	
Unrecorded	825	1345	
Salt sand.....	585	1930	1440'
Mauch Chunk, (107')			
Slate	20	1950	
Little lime.....	30	1980	
Slate and shells.....	47	2027	
Pencil cave.....	10	2037	107'
Greenbrier Limestone (180')			
Big Lime	180	2217	180'
Pocono Sandstones (514')			
Big Injun sand.....	60	2277	
Slate	60	2337	
Squaw sand.....	103	2440	
Slate and shells.....	271	2711	
Berea sand.....	20	2731	514'

This section shows the interval between the bottom of the Pittsburgh coal and the top of the Berea sand to be over 2700 feet.

The following section was measured descending the hill north of Yawkey, Duval district, and joined onto the Emma Griffith deep well No. 5 (L-24).

Yawkey Section, Duval District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (397')			
Sandstone, buff, medium coarse-grained (Connellsville)	30	30	
Dark red, limy shales.....	40	70	
Sandstone, coarse-grained (Morgantown)	40	110	
Red and sandy shales.....	12	122	
Fire clay (Elk Lick coal).....	1	123	
Limestone, dark yellowish.....	2	125	
Dark red, limy shales.....	25	150	
Sandstone, buff, coarse-grained, iron ore nodules (Grafton).....	23	173	
Sandy shales.....	10	183	
Limestone, dark gray (Ames horizon)...	2	185	
Red shale, iron nodules.....	15	200	
Sandstone	30	230	
Red and sandy shale.....	18	248	
Limestone, yellowish.....	2	250	
Red and sandy shale.....	24	274	
Limestone	3	277	
Red shale.....	3	280	
Sandstone, soft, friable (Buffalo).....	19	299	
Fire clay.....	1	300	
Red and sandy shale.....	13	313	
Limestone, dark, (Brush Creek?).....	2	315	
Red shale.....	5	320	
Sandstone, massive, (Mahoning).....	61	381	
Fire clay.....	2	383	
Sandstone	14	397	397'
Allegheny Series (133')			
Coal, (Upper Freeport), to top of boring, 770' A. T.	3	400	
Soil and clay.....	10	410	
Slate	20	430	
Sand	40	470	
Slate	60	530	133'
Pottsville Series (1322')			
Sand, Roaring Creek.....	100	630	
Coal, Lewiston.....	3	633	
Slate	97	730	
Sand	60	790	
Slate and sand.....	435	1225	
Salt sand	630	1855	1325'

	Thickness Feet.	Total Feet.	
Mauch Chunk (35')			
Little lime.....	30	1885	
Pencil cave.....	5	1890	35'
Greenbrier Limestone (185')			
Big Lime.....	185	2075	185'
Pocono Sandstones (530')			
Big Injun sand.....	50	2125	
Slate	75	2200	
Shells	150	2350	
Slate	215	2565	
Brown shale.....	20	2585	
Berea sand.....	20	2605	
Catskill, Chemung, Portage Series (1797')			
Slate	69	2674	
Shell	18	2692	
Slate	58	2750	
Shell	4	2754	
Slate	46	2800	
Shell	75	2875	
Slate, light gray...	675	3550	
Brown shale.....	150	3700	
Black shale.....	50	3750	
Shell	40	3790	
Slate	150	3950	
Black slate to bottom.....	312	4402	1797'

This section gives very interesting information, since it goes to 1797 feet below the bottom of the Berea sand without reaching the Corniferous limestone, while in the Harvey well at Central City this limestone was struck at 1005 feet below the bottom of the Berea sand. This indicates that the strata below the Berea thicken rapidly southward from the Ohio river as well as the Pottsville series above this sandstone. In the Slaughter creek deep well a few miles above Charleston, drilled by Wm. Seymour Edwards, the Berea-Corniferous interval was 2840 feet, so that this Emma Griffith well No. 5 probably stopped several hundred feet above the Corniferous limestone.

The following section was measured with hand-level descending the hill from the south at Hamlin, Carroll district, Lincoln county:

Hamlin Section, Carroll District.

	Thickness Feet.	Total Feet.
Conemaugh Series (380')		
Sandstone, massive, conglomeratic, (Con-		
nellsville)	40	40
Red and sandy shale.....	25	65
Limestone, dark magnesian.....	2	67
Sandy shale and sandstone.....	11	78
Red shale and rotten limestone.....	12	90
Sandy shale.....	7	97
Sandstone	12	109
Red and sandy shales.....	37	146
Fire clay, (Elk Lick?).....	1	147
Red, limy shales.....	24	171
Sandstone	5	176
Fire clay.....	1	177
Sandy shale.....	5	182
Red and yellow limy shale.....	12	194
Sandstone, flaggy.....	5	199
Dark red limy shale.....	16	215
Sandy shale.....	16	231
Red and yellow shale.....	7	238
Sandstone, Buffalo.....	66	304
Fire clay and slate, (Brush Creek).....	5	309
Sandstone, flaggy.....	30	339
Fire clay (Mahoning coal horizon).....	5	344
Sandstone and concealed, Mahoning.....	36	380
Upper Freeport coal and clay to 665' A. T	5	385

380'

The following section was measured with aneroid along the road leading into Garretts Bend, Duval district, and joined onto the Garretts well (L-1), drilled by the Holly Oil and Development Co.:

Garretts Bend Section, Duval District.

	Thickness Feet.	Total Feet.
Conemaugh Series (535')		
Sandstone, (Lower Pittsburgh).....	70	70
Fire clay (Lower Pittsburgh coal).....	5	75
Sandstone, massive, coarse-grained, (Con-		
nellsville)	70	145
Red shale.....	20	165
Sandstone	10	175
Red shale	15	190
Sandstone, Morgantown.....	20	210
Dark red shale, mixed with sandy shale.	18	228
Limestone, impure.....	2	230
Dark red shale.....	13	243
Sandstone, massive, buff, (Grafton).....	27	270
Red and sandy shale mixed with limestone	40	310
Limestone, impure.....	5	315

	Thickness Feet.	Total Feet.	
Red and sandy shale.....	22	337	
Limestone, nodular.....	3	340	
Red and sandy shale.....	10	350	
Sandstone, friable, buff (Buffalo).....	33	383	
Red shale with limestone nodules.....	2	385	
Sandy shale and sandstone.....	23	408	
Red shale, limestone nodules.....	9	417	
Limestone, impure.....	3	420	
Limestone, dark green.....	2	422	
Sandstone, friable.....	18	440	
Limestone	2	442	
Concealed to top of boring, 695' A. T....	23	465	
Conductor	16	481	
Slate	54	535	
Allegheny Series (235')			
Slate shells.....	130	665	
Sand	20	685	
Slate	80	765	
Coal, (No. 5 Block).....	5	770	235'
Pottsville Series (1113')			
Slate	75	845	
Sand, soft.....	30	875	
Sand, hard.....	60	935	
Lime	20	955	
Sand	90	1045	
Slate	10	1055	
Sand	40	1095	
Slate	70	1165	
Lime and slate.....	135	1300	
Sand and lime.....	50	1350	
"Gas" sand.....	115	1465	
Slate	10	1475	
Sand	224	1699	
Coal, (possibly Sewell).....	3	1702	
Sand	181	1883	1113'
Greenbrier Limestone (212')			
Big Lime.....	212	2095	212'
Pocono Sandstones (517')			
Big Injun sand.....	58	2153	
Slate	168	2321	
Lime and slate.....	266	2587	
Berea sand.....	25	2612	517'
Slate to bottom.....	3	2615	

This section begins with the Lower Pittsburgh sandstone, forming a heavy, massive, coarse grained ledge, capping the top of the high knob. The Connellsville sandstone has attained an unusual thickness, and is nearly similar in aspect to the Lower Pittsburgh sandstone. This section also shows an unusual amount of red shale and limestone. The interval

between the Pittsburgh coal and the top of the Berea is over 2600 feet.

The following section was measured with aneroid descending the hill from Stowers Knob to the southeast, Union district.

Stowers Knob Section, Union District.

Conemaugh Series (455')	Thickness	Total
	Feet.	Feet.
Sandstone and sandy shale.....	22	22
Sandstone, massive.....	130	152
Red limy shale.....	5	157
Sandy shale.....	18	175
Dark red shale.....	18	193
Limestone, blue, hard, and fairly pure...	1	194
Red limy shale.....	30	224
Sandstone and sandy shale.....	44	268
Limestone, rotten, yellowish.....	3	271
Sandstone, fine-grained, buff.....	50	321
Limestone	3	324
Sandy shale and sandstone.....	11	335
Fire clay, (Bakerstown).....	3	338
Sandstone, medium-grained, Buffalo.....	60	398
Sandy shale.....	12	410
Sandstone, massive, (Mahoning).....	45	455
Coal, (Upper Freeport).....	2	457

455'

Whether the great sandstone mass 130 feet thick near the top of this section is the Connellsville or Morgantown horizon is uncertain, but probably the latter, judging from the red shale group below.

The following section was measured with aneroid descending from a high hill east of Branchland, Sheridan district, to Branchland:

Branchland Section, Sheridan District.

Allegheny Series (233')	Thickness	Total
	Feet.	Feet.
Sandstone and concealed, Mahoning?....	40	40
Red limy shale (weathered red).....	15	55
Sandstone, sandy shale and concealed...	25	80
Limy red shale (weathered red).....	5	85
Sandstone, massive, coarse-grained.....	15	100
Sandstone and concealed.....	30	130
Sandstone, ferriferous, massive.....	45	175
Sandy shale.....	8	183
Coal blossom, (No. 5 Block).....	2	185
Sandstone, sandy shale and concealed...	23	208
Sandy shale and concealed.....	25	233

233'

	Thickness Feet.	Total Feet.	
Kanawha Series (152')			
Sandstone, massive, coarse, gray, Homewood	98	331	
Fire clay.....	2	333	
Sandy shale and sandstone.....	21	354	
Coal, (Stockton-Lewiston)	6	360	
Sandstone, sandy shale and concealed to 600' A. T.....	25	385	152'

This section begins with the Mahoning sandstone and extends to the Stockton-Lewiston coal, and is important in that it gives the intervals between the No. 5 Block and the Stockton coals. The Freeport coals appear to be absent from the section, and the Homewood sandstone has thickened to an enormous ledge and lost its massiveness.

The following section was measured with aneroid descending hill to the Chesapeake & Ohio Railroad track, one fourth mile south of Midkiff, Laurel Hill district:

Midkiff Section, Laurel Hill District.

	Thickness Feet.	Total Feet.	
Allegheny Series (160')			
Sandstone, sandy shale and concealed..	20	20	
Sandstone, massive, medium-grained, gray	5	25	
Light limy shales.....	2	27	
Sandstone and sandy shale.....	13	40	
Sandy shale and sandstone.....	40	80	
Sandy shale, sandstone and concealed...	80	160	160'
Kanawha Series (350')			
Sandstone, Homewood	90	250	
Sandy shale and sandstone	70	320	
Sandy shale, sandstone, and concealed...	70	390	
Coal blossom, (Coalburg?)	5	395	
Sandy shale.....	15	410	
Sandstone, massive, fine-grained, Winifrede?	20	430	
Fire clay, coal, etc., (Winifrede)	5	435	
Sandy shale.....	10	445	
Sandstone, massive, medium-grained....	55	500	
Coal blossom, (Chilton?)	1	501	
Sandy shale to railroad track, 603' A. T..	9	510	

This section begins near the top of the Allegheny series and extends into the Kanawha. The No. 5 Block and the Stockton-Lewiston coals appear to be concealed; while the Coalburg, Winifrede and Chilton coals make their appearance.

The following section was measured with aneroid descending into Green Shoals Branch of Guyan river, Harts Creek district, 2 miles east of Ferrellsburg and is joined to the Lincoln Land Association well No. 7 (L-572) drilled by the South Penn Oil Company. Record of well furnished by the South Penn Oil Company.

Green Shoals Section, Harts Creek District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (65')			
Sandstone, buff, conglomerate forming cliffs, Mahoning.....	65	65	65'
Allegheny Series (153')			
Sandy shale.....	25	90	
Sandstone, massive, coarse, grayish-buff..	57	147	
Coal blossom, No. 5 Block.....	3	150	
Sandstone and sandy shale.....	35	185	
Fire clay, dark.....	3	188	
Sandstone, massive, ferriferous, buff.....	20	208	
Sandy shale.....	10	218	
Kanawha Series (818')			
Sandstone, massive, ferriferous, Home- wood	80	298	
Sandy shale and sandstone.....	15	313	
Sandstone, medium-grained.....	25	338	
Coal, blocky.....1' }			
Coal, laminated. 1 }			
Slate and fire clay }			
streaked with coal 3 }			
Stockton-Lewiston	5	343	
Sandstone and sandy shale.....	59	402	
Coal blossom, (Coalburg).....	1	403	
Sandstone, massive, for 30', then shaly...	73	476	
Coal blossom, (Winifrede).....	2	478	
Sandstone and sandy shale.....	8	486	
Coal blossom, Winifrede.....	2	488	
Sandstone, massive.....	23	511	
Fire clay and slaty shale.....	2	513	
Sandstone, massive, grayish buff.....	65	578	
Sandstone and sandy shale to top of bor- ing, 700' A. T.	42	620	
Soil	20	640	
Sand	40	680	
Lime	8	688	
Coal, No. 2 Gas?.....	4	692	
Shale	41	733	
Lime	45	778	
Slate	24	802	
Sand	30	832	
Shale	70	902	
Lime	38	940	
Coal	6	946	
Slate	90	1036	818

	Thickness Feet.	Total Feet.	
Middle and Lower Pottsville (834')			
Shale	70	1106	
Slate	55	1161	
Lime	30	1191	
Slate	10	1101	
Salt sand.....	369	1570	
Slate	150	1720	
Sand	35	1755	
Slate	60	1815	
Sand	55	1870	834'
Mauch Chunk (102')			
Red rock.....	10	1880	
Lime	15	1895	
Slate	40	1935	
Little lime.....	32	1967	
Slate (Pencil cave).....	5	1972	102'
Greenbrier Limestone (238')			
Big Lime.....	238	2210	238'
Pocono Sandstones (522')			
Red rock.....	20	2230	
Slate	80	2310	
Lime	50	2360	
Slate	160	2520	
Shale	15	2535	
Lime	185	2720	
Shale	4	2724	
Berea Grit.....	8	2732	522'
Slate and lime to bottom.....	372	3104	

Well dry, and abandoned January 3, 1910.

This section starts near the top of the Allegheny series and extends through the different series to the Catskill beds. The Berea sand encountered at 2734 feet is approximately 3300 feet beneath the Pittsburgh coal horizon, thus showing a very decided thickening southward of the Pottsville series.

The following section was measured with aneroid descending hill into Bernie, Jefferson district, and is joined onto Lincoln Land Association well No. 5 (L-499), drilled by the South Penn Oil Company:

Bernie Section, Jefferson District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (272')			
Sandstone, massive, making high cliffs...	50	50	
Sandy shale and concealed.....	55	105	
Sandstone, medium coarse-grained, buff..	60	165	
Red, limy shales.....	35	200	
Sandstone and concealed to top of bor-			
ing 820' A. T.....	72	272	272'

	Thickness Feet.	Total Feet.	
Allegheny Series (190')			
Soil	12	284	
Slate	8	292	
Sand	18	310	
Slate	22	332	
Sand	40	372	
Slate	90	462	190'
Pottsville Series (1260')			
Sand, Homewood.....	106	568	
Slate	10	578	
Sand	104	682	
Slate	90	772	
Sand	10	782	
Slate	50	832	
Sand	10	842	
Slate	115	957	
Sand	55	1012	
Slate	70	1082	
Sand	130	1212	
Lime shells.....	10	1222	
Sand	50	1272	
Slate	20	1292	
Lime	25	1317	
Sand	48	1365	
Lime	10	1375	
Sand	207	1582	
Slate	50	1632	
Sand (base of Pottsville).....	90	1722	1260'
Mauch Chunk (85')			
Lime.	15	1737	
Sand	10	1747	
Slate	15	1762	
Little lime.....	35	1797	
Slate, "Pencil cave".....	10	1807	85'
Greenbrier Limestone (195')			
Big Lime.....	75	1882	
Sand	10	1892	
Lime	30	1922	
Sand	10	1932	
Lime	70	2002	195'
Pocono Sandstones (520')			
Sand .....10' } Big Injun.....	32	2034	
Slate .....18 }			
Sand .....4 }			
Slate	88	2122	
Sand, "Squaw".....	75	2197	
Slate and shells	50	2247	
Soft shale.....	247	2494	
Berea Grit.....	28	2522	520'
Catskill Series (419')			
Slate and sand.....	419	2941	419'

Well dry and abandoned February 27, 1909.

This section appears to begin in the lower half of the

Conemaugh series and gives interesting information in regard to the intervals.

The following section was measured with a hand-level, descending hill from the north to the Left fork of Mud river about one mile west of Bulger P. O., Jefferson district:

Bulger Section, Jefferson District.

	Thickness Feet.	Total Feet.
Conemaugh Series (268')		
Sandstone, coarse-grained, small pebbles	11	11
Light red limy shale.....	38	49
Sandstone	33	82
Red sandy shale.....	3	85
Sandstone	26	111
Fire clay.....	3	114
Sandy shale, sandstone and concealed...	27	141
Sandy shale and fire clay.....	16	157
Fire clay.....	3	160
Sandstone, with iron ore nodules.....	52	212
Fire clay and concealed.....	5	217
Sandstone, ferruginous, Mahoning.....	51	268
Allegheny Series (134')		
Coal and slate (Upper Freeport).....	4	272
Sandstone	20	292
Coal and slate, (Lower Freeport).....	1	293
Slate and concealed.....	12	305
Coal and slate.....	1	306
Slate and concealed.....	13	319
Coal and slate.....	3	322
Sandstone and sandy shale.....	58	380
Coal and slate (No. 5 Block).....	4	384
Sandstone and concealed to 785' A. T....	18	402
		134'

The following section was measured with aneroid descending from the west to Beech fork of Fuquay creek, one-half mile north of Priestley, Washington district:

Priestley Section, Washington District.

	Thickness Feet.	Total Feet.
Conemaugh Series (451')		
Sandstone, coarse (Upper Connellsville)	30	30
Red shale.....	5	35
Sandstone, massive (Upper Connellsville)	50	85
Dark red shale.....	30	115
Red and sandy shale.....	35	150
Sandstone, massive, (Morgantown).....	55	205
Red and sandy shale.....	32	237
Limestone, yellowish, impure (Elk Lick)	3	240
Dark red shales.....	35	275

	Thickness Feet.	Total Feet.
Sandstone, friable (Grafton).....	30	305
Sandy shale.....	2	307
Limestone, light gray, magnesian (Upper Ames)	1	308
Sandy shale.....	9	317
Red shale.....	5	322
Limestone, hard dark gray, (Lower Ames)	3	325
Sandy shale.....	15	340
Sandstone, coarse.....	20	360
Sandy shale and slate.....	10	370
Sandstone, hard, buff (Saltsburg).....	28	398
Coal and slate (Bakerstown).....	2	400
Sandstone, ferruginous, (Buffalo).....	24	424
Fire clay, (Mahoning coal).....	1	425
Sandstone, ferruginous.....	24	449
Slate	2	451
Coal, Upper Freeport, 650' A. T.....	1	452

This section begins about 60 feet below the base of the Monongahela series.

The following section was measured with aneroid descending hill into Sycamore fork of Mud river, 1 mile north of Bulger, Jefferson district:

Sycamore Fork Section, Jefferson District.

	Thickness Feet.	Total Feet.
Conemaugh Series (280')		
Sandstone, Morgantown.....	30	30
Concealed	10	40
Sandstone, Grafton.....	40	80
Red and sandy shale.....	10	90
Limestone, dark gray, impure, Ames?....	2	92
Dark red, limy shale.....	33	125
Sandstone	30	155
Red shale.....	5	160
Limestone, dark gray.....	2	162
Red shale.....	2	164
Sandy shale	9	173
Limestone	2	175
Sandy shale.....	2	177
Sandstone, coarse, (Buffalo).....	36	213
Sandy shale.....	7	220
Sandstone, (Upper Mahoning).....	30	250
Sandy shale.....	5	255
Sandstone (Lower Mahoning).....	25	280
Allegheny Series (169')		
Fire clay (Upper Freeport).....	2	282
Sandstone	28	310
Fire clay (Lower Freeport).....	2	312
Sandy shale and sandstone.....	58	370
Sandy shale.....	2	372

	Thickness Feet.	Total Feet.	
Sandstone, massive.....	48	420	
Coal and slate (No. 5 Block).....	5	425	
Slate and sandstone.....	20	445	
Coal and slate, Clarion?.....	4	449	169'
Sandstone, hard, massive, Homewood...	42	491	
Coal and slate (Lewiston) 790' A. T.....	4	495	

This gives an interesting section, starting with the Morgantown sandstone and extending to the Lewiston coal.

The following section was taken with aneroid descending into head of Cobbs creek, Duval district, 4 miles northeast of MacCorkle, W. Va.:

Cobbs Creek Section, Duval District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (457')			
Coal and slate, (Little Pittsburgh).....	1	1	
Red shale	80	81	
Sandstone, medium coarse, (Connellsville)	40	121	
Red, limy shale.....	20	141	
Sandstone, coarse, buff, (Morgantown)...	45	181	
Red and sandy shale.....	25	231	
Sandstone, Grafton.....	50	281	
Red shale	25	306	
Sandstone	30	336	
Red, limy shale.....	29	365	
Limestone, dark, (Brush Creek?).....	1	366	
Sandstone and concealed (Mahoning)....	91	457	457'
Coal (Upper Freeport), 770' A. T.....	4	461	

The above section would give the thickness of the Conemaugh series slightly over 500 feet.

The following section was measured with aneroid descending a hill from north of Big creek, Chapmansville district, Logan county, one mile south of the Lincoln-Logan county line and is joined to Lucas well No. 1, drilled by the Pelham Oil & Gas Company:

Big Creek Section, Chapmansville District.

	Thickness Feet.	Total Feet.	
Allegheny Series (145')			
Sandy shale and concealed.....	45	45	
Sandy shale.....	10	55	
Sandstone and concealed.....	90	145	145'

	Thickness Feet.	Total Feet.	
Kanawha Series (1075')			
Sandstone, current bedded, Homewood..	75	220	
Sandy shale and concealed.....	5	225	
Sandstone	85	310	
Sandy shale and concealed.....	10	320	
Sandstone	90	410	
Sandy shale.....	5	415	
Sandstone	45	460	
Sandy shale and concealed.....	5	465	
Sandstone, coarse, micaceous.....	65	530	
Sandy shale and concealed.....	10	540	
Sandstone, ferruginous.....	65	605	
Sandy shale.....	10	615	
Sandstone, coarse.....	40	655	
Sandy shale and concealed.....	47	702	
Fire clay and coal (Peerless).....	3	705	
Sandstone, massive, fine-grained.....	40	745	
Sandstone, flaggy.....	30	775	
Coal and slate (No. 2 Gas).....	5	780	
Sandstone, fine-grained, gray.....	42	822	
Slate	1	823	
Coal, sulphurous, (Powelton).....	1	824	
Coal, hard.....	0.6"	824 6"	
Slate	0.4"	824 10"	
Sandstone, limy, fossiliferous.....	2	826 10"	
Slate with iron nodules.....	2	828 10"	
Sandstone, fine-grained, bluish gray, to top of boring, 625' A. T.....	21.2"	850	
Mud and gravel.....	58	908	
Sand	7	915	
Slate	222	1137	
Sand	28	1165	
Slate	6	1171	
Sand	29	1200	
Coal	2	1202	
Slate	18	1220	1075'
Middle and Lower Pottsville (530')			
Sand, Sewell?.....	85	1305	
Slate	8	1313	
Lime	12	1325	
Sand	25	1350	
Lime	10	1360	
Sand	60	1420	
Slate	20	1440	
Coal, Sewell?.....	6	1446	
Slate	9	1455	
Lime	65	1520	
Black lime.....	15	1535	
Gray sand.....	135	1670	
Water sand.....	50	1720	
Slate	3	1723	
Sand	27	1750	1750'
Mauch Chunk (226')			
Slate	10	1760	
Lime	20	1780	

	Thickness Feet.	Total Feet.	
Slate	20	1800	
Red rock.....	15	1815	
Lime	15	1830	
Red rock	5	1835	
Slate	3	1838	
Lime	5	1843	
Slate	17	1860	
Lime	10	1870	
Slate	15	1885	
Sandy lime.....	25	1910	
Slate	20	1930	
Little lime.....	30	1960	
Slate	16	1976	226'
Greenbrier Limestone (175')			
Big Lime.....	175	2151	
Red rock to bottom.....	7½	2158½	175'

Gas in Big Lime between 2051 and 2058 feet. Well completed August 18, 1911.

The above section gives important information in regard to the different strata in the southern part of the area. The section begins near the top of the Kanawha series and extends through the Big Lime.

The following section was measured with aneroid descending from Mann's Knob into Trough creek, Harts Creek district, Lincoln county:

Manns Knob Section, Harts Creek District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (170')			
Sandstone, buff, capping top of hill, medium coarse-grained.....	30	30	
Red limy shales.....	20	50	
Red and sandy shales.....	15	65	
Sandstones, coarse-grained, ferruginous..	43	108	
Fire clay.....	2	110	
Red and sandy shales.....	20	130	
Sandstone, coarse, (Buffalo).....	40	170	170'
Allegheny Series (215')			
Sandy shales.....	35	205	
Sandstone	65	270	
Sandy shales, (Upper Freeport).....	10	280	
Sandstone	25	305	
Fire clay and slate.....	5	310	
Sandstone	73	383	
Fire clay and slate.....	2	385	215

	Thickness Feet.	Total Feet.
Kanawha Series (180')		
Sandstone, ferruginous, current bedded, Homewood	119	504
Coal and slate, (Lewiston?).....	3	507
Sandstone and shale.....	26	533
Slate	2	535
Coal and slate, (Coalburg?).....	6	541
Sandstone, medium coarse-grained.....	18	558
Slate and fire clay.....	2	560
Sandstone to 865' A. T.....	5	565

The following section was measured with hand-level descending hill from the south to Fourteen P. O., Laurel Hill district:

Fourteen P. O. Section, Laurel Hill District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (204')			
Sandy shale, sandstone and concealed	10	10	
Red, limy shale.....	20	30	
Sandy shale and sandstone.....	10	40	
Red, limy shale.....	5	45	
Sandstone, massive.....	20	65	
Sandy shale.....	13	78	
Fire clay and coal blossom (Bakerstown)	1	79	
Sandstone, massive, ferriferous, (Buffalo)	34	113	
Fire clay (Brush Creek).....	1	114	
Sandstone, massive, (Mahoning).....	80	194	
Sandy shale.....	10	204	204'
Allegheny Series (217')			
Fire clay, (Upper Freeport)	1	205	
Sandstone, medium coarse-grained, ferriferous	40	245	
Sandy shale.....	18	263	
Coal blossom, (Lower Freeport).....	2	265	
Sandstone, massive.....	44	309	
Coal, slate and fire clay.....	2	311	
Sandstone	5	316	
Sandy shale.....	3	319	
Coal blossom	2	321	
Sandy shale.....	5	326	
Sandstone, massive, medium coarse-grained	44	370	
Fire clay (No. 5 Block).....	1	371	
Sandstone, medium coarse-grained.....	40	411	
Sandy shale.....	10	421	217'
Kanawha Series (60')			
Sandstone, coarse, (Homewood).....	57 6"	478 6"	
Coal .....0' 6" }			
Slate .....0' 4" }			
Coal .....0' 4" }			
Fire clay to 745' A. T.....	14"	481 0"	

The above section shows the Allegheny series to be 217 feet thick, and is interesting in giving the interval between the different coals from the Conemaugh to the Kanawha series.

WAYNE COUNTY SECTIONS.

Several sections taken at different points will now be given for Wayne county.

The following section was measured with aneroid descending hill south of Kenova, Ceredo district:

Kenova Section, Ceredo District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (254')			
Sandy shale and concealed.....	10	10	
Sandstone, massive, lower portion coarse-grained (Grafton).....	65	75	
Concealed	30	105	
Limestone, yellowish impure (Ames)....	2	107	
Red limy shales.....	3	110	
Sandy shales and concealed.....	30	140	
Sandstone, flaggy, (Saltsburg).....	20	160	
Fire clay and slate, (Bakerstown coal)...	2	162	
Limy shales and fire clay.....	8	170	
Sandy shale.....	10	180	
Sandstone, (Buffalo).....	30	210	
Fire clay (Brush Creek coal).....	2	212	
Sandstone, upper portion ferruginous.....28'	42	254	254'
Sanstone, buff.....10			
Sandstone, conglomeratic, large pebbles.. 4			
Allegheny Series (68')			
Fire clay (Upper Freeport).....	2	256	
Sandstone, massive, pebbly at base, Clarion	40	296	
Limestone, silicious, yellow.....	1	297	
Sandstone, fire clay and concealed.....	25	322	
Coal, Middle Kittanning.....	..	....

The following section was measured with aneroid descending hill into Bobs branch along road from the east, Ceredo district, $3\frac{1}{4}$ miles south of Central City:

Bobs Branch Section, Ceredo District.

	Thickness Feet.	Total Feet.
Conemaugh Series (375')		
Sandstone, medium coarse-grained.....	35	35
Red limy shales (Lower Pittsburgh)....	45	80
Sandy shale.....	10	90
Sandstone, buff, friable, lower portion massive, (Connellsville).....	40	130
Red shale	10	140
Sandy shale and sandstone.....	10	150
Dark red limy shales.....	10	160
Red and sandy shale, variegated.....	22	182
Limy fire clay.....	3	185
Sandstone, friable, ferruginous (Morgan- town)	20	205
Red and sandy shale, variegated.....	30	235
Sandstone, flaggy, (Grafton)	30	265
Sandy shale and concealed.....	10	275
Sandstone, friable, ferruginous (Salts- burg)	30	305
Sandy shale and concealed.....	15	320
Sandstone, coarse-grained, conglomerate, (Buffalo)	28	348
Fire clay (Brush Creek coal)	2	350
Sandy shale to 610' A. T.....	25	375

The above section begins a few feet under the base of the Monongahela series. The sandstone near the base of the section is undoubtedly the Buffalo, and the fire clay underneath same represents the Brush Creek coal horizon.

The following section was measured with aneroid descending hill from the north into Mill creek, one mile west of Neal, Ceredo district:

Neal Section, Ceredo District.

	Thickness Feet.	Total Feet.
Conemaugh Series (266')		
Limestone, gray, impure (Elk Lick).....	1	1
Sandy shale.....	5	6
Sandstone, coarse-grained, (Grafton)....	45	51
Fire clay	2	53
Sandy shale	5	58
Limestone, dark yellowish, (Ames).....	3	61
Red limy shale.....	10	71
Limestone, yellowish, impure (Ewing)...	4	75
Sandy shale	31	106
Sandstone, coarse, ferruginous, (Salts- burg)	45	151
Sandy shale and concealed.....	5	156
Sandstone, dark gray, coarse, (Buffalo)..	30	186

	Thickness Feet.	Total Feet.	
Fire clay, concealed, and slate.....	5	191	
Sandy shale	20	211	
Sandstone and concealed, (Mahoning)...	55	266	266'
Fire clay and coal (Upper Freeport coal)	2	268	
Concealed to 535' A. T.....	8	276	

The following section was measured with aneroid descending hill from Watts Ridge into Flat creek:

Watts Ridge Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (305')			
Sandstone, massive, coarse and conglomerate (Morgantown)	25	25	
Limy shale	5	30	
Sandy shale and limestone (Elk Lick)...	10	40	
Sandstone, massive, conglomeratic, (Grafton)	75	115	
Sandy shale and concealed.....	25	140	
Sandy shale	10	150	
Limestone, (Ames).....	1	151	
Limy and red shales.....	29	180	
Sandy shale and concealed.....	5	185	
Sandstone, massive, coarse, micaceous (Saltsburg)	30	215	
Sandy shale.....	10	225	
Sandstone, massive, coarse, (Buffalo)...	30	255	
Sandy shale	5	260	
Sandstone, massive, coarse, friable, (Mahoning)	45	305	305'
Allegheny Series (130')			
Sandy shale (U. F. coal horizon)...	5	310	
Sandy shale and sandstone.....	53	363	
Coal blossom, (Lower Freeport).....	2	365	
Sandstone, massive, (Freeport).....	67	432	
Coal, (No. 5 Block), to 735' A. T.....	3	435	130'

The following section was measured with aneroid descending hill from top of Turkey Camp Knob to the west:

Turkey Camp Knob Section, Stonewall District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (445')			
Sandy shale, sandstone and concealed....	30	30	
Sandstone, massive, conglomeratic, friable (Connellsville)	65	95	
Sandstone and concealed.....	20	115	
Sandy shale	10	125	
Red limy shale.....	17	142	
Sandstone, sandy shale and concealed...	35	177	
Sandy shale and sandstone, Morgantown	55	232	
Lime and sandy shale.....	5	237	
Sandstone, (Grafton)	23	260	

	Thickness Feet.	Total Feet.
Sandy shale	5	265
Sandstone, massive, friable, micaceous...	25	290
Sandy shale and fire clay.....	10	300
Sandstone, massive, coarse, (Saltsburg) ..	40	340
Sandy shale.....	5	345
Sandstone, Buffalo.....	45	390
Sandy shale	5	395
Sandstone, massive, coarse, Mahoning...	47	442
Coal, (Upper Freeport), to 810' A. T.....	3	445
		445'

The above section begins about 50 feet below the base of the Monongahela series and thus makes the Conemaugh series 495 feet thick.

Wheeler Knob is a high point 2 miles southeast of Wayne, and the following section was measured with aneroid descending along road to Elmwood.

Wheeler Knob Section, Union District.

	Thickness Feet.	Total Feet.
Conemaugh Series (441')		
Red limy shales.....	25	25
Sandstone, coarse, conglomeratic, (Connellsville)	55	80
Sandy shale and concealed.....	50	130
Limestone, dark gray.....	4	134
Red limy shales.....	16	150
Sandstone, (Morgantown)	29	179
Fire clay, (Elk Lick coal).....	1	180
Red limy shales.....	18	198
Limestone, dark, (Elk Lick).....	2	200
Sandstone, flaggy	11	211
Limy shale and limestone, Elk Lick.....	2	213
Dark red shales.....	2	215
Sandy shales	9	224
Fire clay.....	1	225
Sandstone, flaggy, (Grafton).....	25	250
Red and sandy shale and sandstone.....	17	267
Red limy shales, variegated.....	8	275
Sandstone, ferruginous, (Saltsburg).....	53	328
Fire clay, slate and coal (Bakerstown)...	2	330
Sandstone	25	355
Sandy shale	25	380
Sandstone coarse-grained, (Buffalo).....	31	411
Fire clay, coal and slate, (Brush Creek)	4	415
Sandstone, (Mahoning)	26	441
		441'
Allegheny Series (109')		
Fire clay and coal (Upper Freeport).....	4	445
Sandstone and concealed.....	22	467
Fire clay, (Lower Freeport coal).....	3	470
Sandstone and concealed.....	42	512
Coal and slate (North Coalburg).....	3	515
Sandstone and concealed to Twelvepole..	35	550
		109'

This section begins 40 to 50 feet below the base of the Monongahela series and gives some interesting data in regard to the intervals of the different strata in the Conemaugh.

The following section was measured with aneroid descending the hill from the south to Dunlow, Lincoln district, and is joined onto the Guyandot Land Association well (W-12) drilled by the Guyan Oil Company:

Dunlow Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Allegheny Series (210')			
Sandstone and concealed.....	80	80	
Sandstone, coarse.....	65	145	
Sandstone, massive, friable (East Lynn).....	60	205	
Fire clay (No. 5 Block coal horizon).....	5	210	210'
Pottsville Series (1272')			
Sandstone, massive, (Homewood).....	134	344	
Fire clay (Stockton-Lewiston coal horizon).....	6	350	
Sandstone and concealed.....	90	440	
Fire clay	5	445	
Sandstone	20	465	
Coal and slate, (Coalburg) Upper Dunlow.....	5	470	
Sandstone and concealed.....	22	492	
Coal and slate, (Winifrede) Lower Dunlow.....	3	495	
Sandstone and concealed.....	52	547	
Coal and slate.....	3	550	
Concealed to top of boring at 680' A. T. .	10	560	
Surface	60	620	
Sandstone, medium hard, gray.....	60	680	
Sand, soft, gray, shelly, and slaty.....	40	720	
Sand, white	35	755	
Sand, dark shale, and coal.....	5	760	
Sand, soft, white.....	40	800	
Shale, soft, gray, sticky.....	20	820	
Sand, hard, gray.....	20	840	
Coal, Warfield (No. 2 Gas).....	5	845	
Shale, soft, black, with traces of coal in upper part	100	945	
Shale, hard, black and lime.....	15	960	
Lime, hard, gray.....	10	970	
Shale, black, soft.....	40	1010	
Sand, hard, gray to white, holding much salt water	155	1165	
Coal? "break"			
Sand, hard, gray, with thin "breaks" of shale	310	1475	
Shale and hard limestone.....	7	1482	1272'
Greenbrier Limestone (232')			
Limestone, hard, black.....	18	1500	
Limestone, hard, gray, with slate too thin to record	18	1518	
Limestone, gray, hard, slate break at 2'..	8	1526	

	Thickness Feet.	Total Feet.
Limestone, hard, white, gas at 100' to 110' in	160	1686
Limestone, hard, dark gray, show of oil at 6' to 8' in.....	28	1714
		232'

The above section shows the interval between the Ne. 5 Block coal and No. 2 Gas coal to be 630 feet, as compared with 752 feet in the Morris Creek section, 2 miles south of Montgomery, Fayette county, where both of these coals are mined. Dunlow is S 85° W 60 miles from the Morris Creek section.

The following section was measured with aneroid descending from the north to mouth of Arkansas branch of Twelvepole, Lincoln district, and joined to the A. W. Wilson well (W-26) :

Arkansas Branch Section, Lincoln District.

	Thickness Feet.	Total Feet.
Allegheny Series (275')		
Sandstone, sandy shale, and concealed...	99	99
Fire clay	1	100
Sandstone, massive, friable, coarse.....	37	137
Sandy shale	1	138
Sandstone and concealed.....	20	158
Coal and slate, (Upper Freeport).....	2	160
Sandstone and concealed.....	25	185
Fire clay, (Lower Freeport).....	2	187
Sandstone, massive, coarse, to bench (East Lynn).....	78	265
Concealed (No. 5 Block coal horizon)...	10	275
Pottsville Series 1476')		275'
Sandstone, (Homewood)	95	370
Fire clay (Stockton-Lewiston).....	2	372
Sandstone to bench.....	55	427
Sandstone, (Coalburg).....	53	480
Fire clay, (Coalburg).....	2	482
Sandstone, massive, friable, coarse-grained (Upper Winifrede).....	78	560
Coal and slate, (Winifrede?).....	1	561
Sandstone and concealed to top of boring, 720' A. T.....	14	575
Rock	34	609
Slate	41	650
Coal	4	654
Slate with seams of rock.....	337	991
Coal, Eagle?.....	6	997
Slate with seams of rock (gas estimated, 1,000,000)	264	1251
White sand.....	280	1531
Black sand.....	86	1617

	Thickness Feet.	Total Feet.	
Slate and sand.....	87	1704	
Slate	5	1709	
Sand	42	1751	1476'
Mauch Chunk (40')			
Slate	40	1791	40'
Greenbrier Limestone (210')			
Limestone	210	2001	210'
Pocono Sandstones (542').			
Slate	180	2181	
Red rock	60	2241	
Slate	250	2491	
Lime	15	2506	
Slate	30	2536	
Sand, (Berea)	7	2543	542'

Hooker Knob is a high point 3 miles east of Dunlow, Lincoln district, and from it the following section was measured along the road with aneroid, descending towards the west to Twelvepole, 1 mile southeast of Dunlow:

Hooker Knob Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Allegheny Series (205')			
Sandstone shelf.....	35	35	
Limy shales.....	10	45	
Fire clay and concealed.....	5	50	
Sandstone and concealed.....	48	98	
Fire clay	2	100	
Sandstone	30	130	
Fire clay.....	5	135	
Sandstone, friable, coarse.....	65	200	
Coal and slate (No. 5 Block?).....	5	205	205'
Kanawha Series (490')			
Sandstone, massive, Homewood.....	190	395	
Coal and slate, Lewiston.....	5	400	
Sandstone, flaggy, ferruginous.....	15	415	
Sandy shale and concealed.....	10	425	
Sandstone, massive, (Coalburg).....	95	520	
Coal and slate (Coalburg), Upper Dunlow	5	525	
Sandstone and concealed.....	30	555	
Fire clay, coal and slate, (Winifrede)...	5	560	
Sandstone	40	600	
Sandy shale.....	5	605	
Sandstone and concealed to 675' A. T....	90	695	490'

The following section was measured with aneroid descending hill 1 mile northeast of Glenhayes and joined onto well No. 1 (W-19) drilled by the South Penn Oil Company on the land of the Glenhayes Company. Record of well fur-

nished by Mr. C. C. Mackubin, Vice-President and General Manager of the Glenhayes Company.

Glenhayes Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (120')			
Sandstone, coarse-grained, conglomerate, making massive cliffs, (Mahoning)....	120	120	120'
Allegheny Series (100')			
Slate, fire clay, (Upper Freeport coal) ..	5	125	
Sandstone	20	145	
Limestone, impure.....	2	147	
Coal and slate, (Lower Freeport).....	3	150	
Sandstone	65	215	
Fire clay (No. 5 coal).....	3	218	
Sandy shale and iron ore.....	2	220	100'
Kanawha Series (575')			
Sandstone, coarse, conglomeratic, (Home- wood	65	285	
Fire clay and coal (Stockton-Lewiston) ..	5	290	
Sandstone, ferruginous (Coalburg).....	118	408	
Coal and slate, (Coalburg).....	2	410	
Sandstone, (Upper Winifrede).....	68	478	
Fire clay and slate (Winifrede coal hori- zon)	2	480	
Sandstone, (Lower Winifrede).....	58	538	
Coal and slate (Chilton) to top of boring at 635' A. T.....	2	540	
Surface	24	564	
Slate	11	575	
Coal	2	577	
Slate	38	615	
Sand	50	665	
Coal (Thacker?).....	5	670	
Slate	145	715	
Sand	30	745	
Coal, (Warfield No. 2 Gas?).....	2	747	
Slate	28	775	
Sand	20	795	575'
Middle and Lower Pottsville Series (555')			
Slate and shells.....	220	1015	
Salt sand.....	80	1095	
Slate and shells.....	95	1190	
Sand	160	1350	555'
Mauch Chunk (100')			
Red rock	15	1365	
Little lime	10	1375	
Lime shells	75	1450	100'
Greenbrier Limestone (198')			
Big lime	198	1648	198'
Pocono Sandstones (577')			
Unrecorded	192	1840	
Slate and shells.....	357	2197	
Berea Grit.....	28	2225	577'
Devonian (465')			
Slate	465	2690	465'
"Showing of oil and gas in Berea."			

The above section gives some important measurements in the different formations in the Kanawha series. The interval between the No. 5 Block coal and No. 2 Gas or Warfield seam appears to be 528 feet, as compared with 630 feet in the Dunlow section.

The following section was measured with hand-level descending hill at Fort Gay, Butler district, opposite Louisa, Ky.

Fort Gay Section, Butler District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (82')			
Concealed	5	5	
Sandstone, coarse-grained, (Buffalo).....	20	25	
Sandy shale and concealed (Brush Creek limestone, fossiliferous).....	7.4	32.4	
Coal, (Brush Creek).....	1.6	35	
Sandstone, massive....26' }			
Sandstone, shaly..... 4 }	47	82	82'
Sandstone, flaggy.....17 }			
Allegheny Series (191')			
Yellowish limy shale...3' }			
Sandy shale.....6 }			
Red limy shale.....3 }			
Fire clay	1	95	
Sandy shale and sandstone.....	20	115	
Sandstone, massive.....	25	140	
Concealed	19	159	
Fire clay and slate (Upper Kittanning)..	4	163	
Sandstone .....10' }			
Sandy shale..... 2 }			
Sandstone, ferruginous 46 }			
Sandstone, massive....10 }			
Limestone, ferruginous.....	1	232	
Sandy shale	2	234	
Slate and fire clay....1.5' }			
Coal and slate.....1 }			
Coal .....0.5 }			
Sandy shale and sandstone.....	5.8	242.8	
Coal blossom	0.2	243	
Fire clay and gray sandstone.....	10	253	
Concealed	20	273	191'
Sandstone, massive, pebbly, (Homewood)	40	313	

This section is very important, since it gives the thickness of the Allegheny Series in the most western portion of the State where the measures rise out of the great Parkersburg syncline between Kenova and Fort Gay. The coals in the Allegheny series appear to be represented by fire clays and limestones and there is very little coal in any of the beds.

The following section was measured with aneroid descending the high hill from the northeast at Hubbardstown and joined to the Meyers core drill hole at Hubbardstown, which was sunk on the land of the Meyers heirs:

Hubbardstown Section, Butler District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (245')			
Sandy shale and concealed.....	20	20	
Sandstone, massive, coarse-grained.....	50	70	
Sandy shale and concealed.....	13	83	
Sandstone, coarse, buff (Saltsburg).....	47	130	
Sandy shale	6	136	
Limestone, fossiliferous, Pine Creek.....	4	140	
Sandstone, coarse, conglomeratic, (Buffalo)	48	188	
Sandy shale	2	190	
Limestone, fossiliferous.....	2	192	
Coal and slate (Brush creek)	6	198	
Fire clay	2	200	
Sandy shale and concealed.....	45	245	245'
Allegheny Series (159')			
Coal and slate, (Upper Hubbardstown)			
(Upper Freeport).....	5	250	
Sandstone and sandy shale.....	15	265	
Shale and concealed.....	10	275	
Coal and slate (Lower Hubbardstown)			
(Lower Freeport).....	2	277	
Concealed to Meyers core drill hole			
(W-51) at 515' A. T.....	40	317	
Hard, and soft, sandy soil.....	26	343	
Sandstone, white.....	22	365	
Slate, gray	9	374	
Coal, (Middle Kittanning)	1'8"	375'8"	
Fire clay	3	378'8"	
Sandstone	16	394'8"	
Sandy slate.....	4'8"	399'4"	
Coal, (No. 5 Block), (Lower Kittanning) .	2'8"	402	
Fire clay.....	2	404	159'
Kanawha Series (105')			
Sandstone, (Homewood)	63	467	
Slate	16	483	
Coal, (Stockton-Lewiston)	1	484	
Fire clay.....	3	487	
Slate	17	504	
Coal, (Coalburg)	2	506	
Fire clay.....	1	507	
Sand and lime to bottom.....	2	509	105'

This is a very interesting section in that it gives measurements between important strata in the western portion of the State. The section begins at the top of the Grafton sandstone and gives the thickness of the Conemaugh series 245 feet,

which is possibly 300 feet below the Pittsburgh coal, making the Conemaugh series over 500 feet thick at this point.

The following section was measured with aneroid descending the hill south of Stonecoal, Lincoln district, and joined onto the T. J. Stepp Well No. 1 (W-14) drilled by the Meteor Carbon Company:

Stonecoal Section, Lincoln District.

	Thickness. Feet.	Total. Feet.
Upper, Lower and Middle Pottsville (1334')		
Sandstone, massive, medium coarse grained, Homewood	85	85
Concealed, Stockton-Lewiston coal	5	90
Sandstone and concealed to bench.....	35	125
Concealed	5	130
Sandstone, massive, medium coarse grained, forming bold cliff 100' high (Coalburg)	120	250
Concealed	10	260
Sandstone and concealed.....	125	385
Concealed, (Winifrede coal horizon).....	5	390
Sandstone and concealed.....	115	505
Concealed	5	510
Sandstone to top of boring at 614' A. T..	34	544
Gravel	45	589
White lime.....	5	594
Coal, (Warfield seam, No. 2 Gas)	5	599
White slate.....	85	684
White sand (salt water at 684').....	5	689
White slate.....	20	709
White sand.....	10	719
White slate.....	50	769
White sand.....	5	774
White slate.....	15	789
White sand.....	35	824
White slate.....	30	854
Black slate.....	30	884
Black sand.....	15	899
Black slate.....	45	944
White lime.....	30	974
White slate.....	5	979
White sand (salt water at 1044').....	125	1104
Black slate.....	3	1107
White sand.....	47	1154
Black slate.....	5	1159
White sand.....	75	1234
Black slate.....	20	1254
White sand.....	15	1269
Slate and shells.....	65	1334
Mauch Chunk (295')		
White slate.....	70	1404
Red rock.....	20	1424

	Thickness Feet.	Total Feet.
White slate.....	20	1444
Red rock.....	80	1524
Sand	10	1534
White slate.....	5	1539
Red rock.....	10	1549
White slate.....	45	1594
Little lime.....	30	1624
Black slate.....	5	1629
White lime, (Greenbrier).....	195	1824
Big Injun sand.....	105	1929
Black slate.....	15	1944

295'

The above section begins at the top of the Homewood sandstone, or near the base of the No. 5 Block coal, and gives the interval between that coal and the No. 2 Gas or Warfield, 594 feet.

The following section was measured with aneroid descending hill to Big Sandy river and joined onto the Prichard well K-63, at Kavanaugh, Boyd county, Ky.:

Kavanaugh Section, Boyd County, Ky.

	Thickness Feet.	Total Feet.
Conemaugh Series (468')		
Sandstone, sandy shale and concealed...	25	25
Red limy shale.....	2	27
Sandy shale and concealed.....	11	38
Sandstone, massive, coarse (Connells- ville)	44	82
Concealed	22	104
Red shale.....	5	109
Sandy shale, (Morgantown sandstone)...	21	130
Red limy shales.....	5	135
Sandy shale and sandstone.....	9	144
Limestone, nodular, (Elk Lick).....	2	146
Red limy shales.....	11	157
Sandstone, massive buff, coarse, friable, (Grafton)	50	207
Sandy shale	4	211
Limestone and red limy shales, (Ames)..	1	212
Red and limy shales.....	11	223
Sandstone and concealed, (Saltsburg)...	42	265
Yellowish sandy shale.....	6	271
Limy shale.....	3	274
Fire clay, (Bakerstown coal).....	1	275
Sandy shale.....	15	290
Concealed to top of boring at 550' A. T..	10	300
Blue mud.....	38	338
Gravel	5	343
Blue mud.....	20	363
Slate	25	388
Sand	20	408
Slate	10	418
Sand	50	468

468'

	Thickness Feet.	Total Feet.	
Allegheny and Kanawha Series (900')			
Slate, with a few sandy shells.....	174	642	
Coal, (No. 5 Block).....	3	645	
Slate	27	672	
Sand and lime	68	740	
Sand	45	785	
Slate	35	820	
Sand	55	875	
Slate	5	880	
Brown and dark slate and shells.....	165	1045	
Sand	20	1065	
Black slate and shells.....	79	1144	
Salt sand, gas.....	104	1248	
Slate	30	1278	
Sand, water.....	90	1368	900'
Greenbrier Limestone (170')			
Black slate and lime.....	112	1480	
Big Lime.....	50	1530	
Lime	8	1538	170'
Pocono Sandstones (687')			
Sand and slate.... 57' } Big Injun.....	187	1725	
Sand and slate.... 130 }			
Dark slate.....	440	2165	
Black slate.....	20	2185	
Berea sand.....	40	2225	687
Catskill Series (955')			
Sandy shells and slate.....	40	2265	
Dark slate.....	482	2747	
Dark slate and black lime.....	161	2808	
White slate.....	128	2036	
Brown slate.....	49	3085	
"Raglan sand".....	95	3180	955'

This section starts about 65 feet below the base of the Monongahela series, which would make the Conemaugh about 533 thick. The interval between the Pittsburgh coal horizon and the top of the Berea sand would therefore be 2250 feet, compared with 2245 feet in the Harvey well at Central City.

CHAPTER IV.

THE DUNKARD SERIES.

The Dunkard series is the highest group of rocks of the Carboniferous measures in the Appalachian area, and the most recent in formation, with the exception of the Alluvium deposits along the river bottoms and large streams. This group of rocks was named by Dr. I. C. White from Dunkard creek, a stream in the southwest corner of Pennsylvania. The different beds of the Dunkard series in descending order have been given in the writer's Report on Jackson, Mason and Putnam counties adjoining the area herein described, as well as in other Reports of the Survey and it is unnecessary to repeat them all here. Hence the descriptions which follow will be confined to such beds as occur within this particular area.

The lowest members of the Dunkard series are found only on the summits over a portion of the northeastern part of Cabell county along the Parkersburg syncline where the hills are quite high.

Lower Marietta Sandstone.

The highest member of the series that caps the hills at the headwaters of Seven Mile creek, south of Laclide P. O. is the Lower Marietta sandstone. There, this sandstone measures 20 feet in thickness, is bluish, and fine grained, the top portion being flaggy. This sandstone also caps Huddleston Knob in Union district, Cabell county, and several more of the highest points, but there is not enough of it in the area under discussion to render the same of any importance as a building stone.

The Washington Coal.

The Washington coal occurs just underneath the Lower

Marietta sandstone. This is a very persistent bed and can be traced from southwestern Pennsylvania through the entire western portion of West Virginia and as far southwest as Cabell county where it is found on the tops of the highest hills in the northeastern part of the county. On the road leading from Kilgore creek, Grant district, to the waters of Guyan creek, Hannan district, Mason county, its outcrop shows a section of coal and slate 1 foot thick. It also crops on the west side of a high knob, two miles east of Millers Ferry, Union district. It has no commercial value in the area under discussion and is only important in that it assists in correlating the other measures.

Washington Fire Clay Shales.

Immediately under the Washington coal there occurs a greenish yellow, impure fire clay, ranging in thickness from 2 to 4 feet. It crops along the public highways and can be readily recognized owing to the peculiar color in the soil it produces. This bed of fire clay shales is as persistent as the Washington coal, under which it occurs.

Mr. Ray V. Hennen collected a sample of this clay in Roane county and the following is the analysis of same made by Mr. Krak, Assistant Chemist, under the supervision of Prof. Hite, Chief Chemist of the Survey:

	Per cent.
Silica	56.70
Ferric Iron.....	2.18
Alumina	26.28
Lime	1.04
Magnesia	1.58
Potash	3.01
Soda	0.40
Titanium	0.78
Loss on ignition.....	8.62
Total.....	100.59

The analysis reveals a clay adapted to the manufacture of building brick, having the right percentages of silica, iron and alumina.

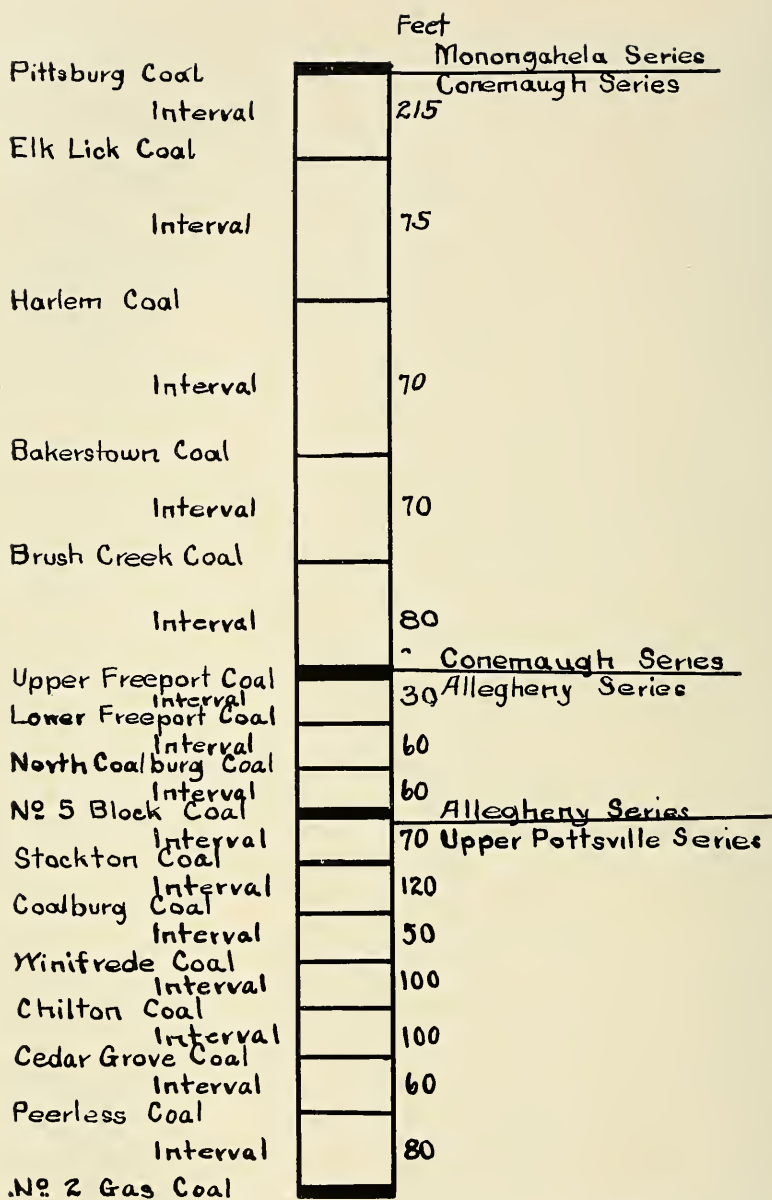


FIG. 3.—Diagram showing Relative Position of the Coals in the Cabell-Wayne-Lincoln Area,

The Mannington Sandstone.

From 10 to 15 feet under the Washington coal in the Cabell-Wayne-Lincoln area, there occurs a flaggy, coarse grained, gray, and buff sandstone, ranging in thickness from 15 to 20 feet. This sandstone has been named by Prof. Grimsley the Mannington sandstone, from its outcrop near the town of that name in Marion county, West Virginia, where it has been quarried for building purposes. A description of this sandstone is given in West Virginia Geological Survey Volume IV, page 440.

This sandstone occurs only in a few of the highest points in the northeastern part of Cabell county, and is therefore of very little use as a building stone.

The Waynesburg "A" coal, which is rather persistent in the northern region of the State, is represented only by a thin streak of fire clay in the highest knobs of northeastern Cabell.

The Waynesburg Sandstone.

From 15 to 20 feet under the Waynesburg "A" coal in the northern part of West Virginia, occurs a great massive sandstone, which the First Geological Survey of Pennsylvania named the Waynesburg from a town near which it is finely developed in Greene county, Pa.

This is one of the most persistent sandstones in the Dunkard series and its outcrop is marked with bold cliffs. It is usually massive, coarse, and quite frequently conglomeratic and buff in color.

In this area the Waynesburg sandstone caps the ridges in Union and a portion of Grant districts, in Cabell county. It forms table lands on the tops of these ridges owing to its resistance to erosion, with steep banks, and it often crops in bold cliffs. This is especially true near Union Ridge in Union district and on the ridge between the headwaters of Seven Mile creek and Guyan creek. Also in Grant district, northeast of Piney Mountain. It is from 40 to 60 feet in thickness.

The Cassville Plant Shale and Elm Grove Limestone appear to have been replaced with dark red shales and were not definitely recognized as separate and distinct strata in this area.

CHAPTER V.

THE MONONGAHELA SERIES.

The series of rocks extends from the bottom of the Cassville Plant shale to the bottom of the Pittsburgh coal. The thickness of the series in the area under discussion ranges from 240 to 300 feet, while in northern West Virginia, where the series is fully developed, the thickness often exceeds 400 feet. A full description of the series is given in Volume II of the West Virginia Geological Survey, page 124, to which the reader is referred.

In the area under discussion the Monongahela series covers a considerable area of Cabell, and portions of northern Lincoln and Wayne counties. Several well distributed sections of the Monongahela series, in addition to those already published in Chapter III, will now be given:

CABELL COUNTY SECTION (Monongahela Series).

The following section was measured with aneroid along road descending from the north into Kilgore creek, Grant district:

Kilgore Section, Grant District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (24')			
Sandstone, coarse, (Waynesburg).....	24	24	24'
Monongahela Series (186')			
Fire clay, (Waynesburg coal horizon)....	1	25	
Red shale.....	15	40	
Sandstone, (Gilboy).....	40	80	
Red and sandy shale.....	30	110	
Sandstone, flaggy, (Uniontown).....	30	140	
Sandy shale.....	10	150	
Sandstone, containing dark nodules.....	25	175	
Dark reddish shale with iron ore nodules	20	195	
Sandstone, friable, (Arnoldsburg).....	10	205	
Red shale to top of Pittsburgh sandstone			
at 770' A. T.....	5	210	



PLATE X.—Old River Deposit, Along Guyandot River at Barboursville, Cabell County.

The following section was measured with aneroid along road from north descending into John branch of Kilgore creek, Grant district:

John Branch Section, Grant District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (95')			
Sandstone, massive, buff, (Lower Marietta)	17	17	
Shale, (Washington).....	3	20	
Sandy shale.....	5	25	
Sandstone, (Mannington).....	15	40	
Sandy shale.....	5	45	
Sandstone, coarse, friable, (Waynesburg)	50	95	95'
Monongahela Series (115')			
Fire clay, (Waynesburg coal horizon)...	1	96	
Sandy shale mixed with reds.....	34	130	
Sandstone, flaggy, (Gilboy).....	25	155	
Red and sandy shale.....	25	180	
Sandstone, massive, (Uniontown) to 760'			
A. T.....	30	210	115'

The following section was measured with hand-level descending hill from Howell, Union district, to Cabell creek:

Howell Section, Union District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (280')			
Red and yellow shale and concealed....	52	52	
Sandstone, friable, buff, (Gilboy).....	28	80	
Sandstone, flaggy.....	14	94	
Red and yellow limy shale.....	20	114	
Sandstone, massive, Uniontown	16	130	
Sandy shale and concealed.....	20	150	
Red and yellow shale, variegated.....	25	175	
Sandstone, friable, (Arnoldsburg).....	20	195	
Red shale.....	5	200	
Sandstone, massive.....	35	235	
Sandy shale, sandstone and concealed...	20	255	
Sandstone and concealed to base of Monongahela	25	280	280'

The following section was measured with aneroid descending the hill along the county road in Union district, Cabell county, 1 mile west of the Cabell-Mason line.

Clover Section, Union District.

	Thickness.	Total.	
	Feet.	Feet.	
Dunkard Series (89')			
Sandstone	10	10	
Red shale.....	15	25	
Sandy shale.....	10	35	
Sandstone, massive, coarse, (Waynesburg)	54	89	89'
Monongahela Series (253')			
Black slate mixed with coal, (Waynesburg)	3	92	
Red and sandy shale.....	30	122	
Sandstone, fine grained, buff, (Gilboy)... ..	35	157	
Sandy shale.....	10	167	
Red shale.....	5	172	
Sandstone, (Uniontown).....	28	200	
Black slate.....	5	205	
Sandstone, massive, (Arnoldsburg).....	22	227	
Red shale.....	8	235	
Sandstone, friable, (Sewickley).....	24	259	
Concealed	8	267	
Red shale.....	15	282	
Sandy shale.....	18	300	
Fire clay and black slate, (Redstone coal horizon)	2	302	
Sandy shale and sandstone, (Pittsburgh)	10	312	
Red shale and limestone nodules.....	25	337	
Fire clay, (Pittsburgh coal horizon).....	5	342	253'
Conemaugh Series (22')			
Sandy shale and sandstone, (Lower Pittsburgh)	15	357	
Sandstone and concealed to creek.....	7	364	22'

The above section shows both the Redstone and the Pittsburgh coal horizons. The Pittsburgh sandstone has lost its massiveness and is broken up into red and sandy shale.

The following section was measured with aneroid descending the hill into Right fork of Mill creek, Grant district, 3 miles northeast of Milton:

Mill Creek Section, Grant District.

	Thickness.	Total.	
	Feet.	Feet.	
Dunkard Series (31')			
Sandstone, buff, friable, (Waynesburg) .	31	31	31'
Monongahela Series (240')			
Fire clay (Waynesburg coal).....	1	32	
Dark red limy shale.....	3	35	
Sandstone, fine grained, shaly, (Gilboy)..	20	55	
Sandstone, friable, (Gilboy).....	40	95	
Dark red shale.....	5	100	
Sandy shale and sandstone, (Uniontown)	30	130	

	Thickness Feet.	Total Feet.	
Dark red shale.....	5	135	
Sandy shale.....	12	147	
Dark red shale.....	3	150	
Sandstone, massive, (Arnoldsburg).....	45	195	
Red and sandy shale.....	10	205	
Sandstone, flaggy.....10'			
Sandstone, massive, buff, friable, conglomeratic	20		Pittsburgh Sandstone..
Sandstone, gray flaggy.....35			
Fire clay, (Pittsburgh coal horizon), 644'			
A. T.....	1	271	240'

The following interesting section was measured with hand-level descending hill to Crown City Ferry, Union district:

Crown City Ferry Section, Union District.

	Thickness. Feet.	Total. Feet.	
Monongahela Series (234')			
Sandstone, coarse, (Gilboy).....	15	15	
Red shale.....	10	25	
Sandstone	15	40	
Sandy shale.....	5	45	
Red shale.....	10	55	
Sandy shale.....	5	60	
Sandstone, coarse, pebbly, (Uniontown) ..	35	95	
Sandy shale.....	19	114	
Red and sandy shale.....	21	135	
Sandstone, massive, pebbly, (Rock Creek)	40	175	
Red shale.....	2	177	
Fire clay and slate, (Redstone coal?)....	2	179	
Sandstone, massive, Pittsburgh.....	50	229	
Fire clay and coal, (Pittsburgh).....	5	234	234'
Conemaugh Series (117')			
Sandstone, shaly.....	23	257	
Limestone, dark gray.....	2	259	
Red and sandy shale.....	22	281	
Sandstone, friable, (Upper Connellsville)	23	304	
Limestone, Clarksburg.....	2	306	
Red and sandy shale.....	20	326	
Concealed to B. & O. R. R., 569' A. T....	25	351	117'

This section is important in that it shows the presence of the Redstone coal, represented by fire clay and the Rock Creek sandstone of Roane county, which may be the Sewickley.

The following section was measured with hand-level descending from Huddleston Knob towards the south into McComas creek, Union district:

Huddleston Knob Section, Union District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (153')			
Sandstone, medium fine grained, (Lower Marietta)	15	15	
Red shale, Washington coal horizon.....	20	35	
Sandstone, flaggy, (Mannington).....	25	60	
Red shale.....	10	70	
Sandy shale and sandstone, (Waynesburg)	30	100	
Red shale, limestone nodules.....	20	120	
Sandy shale.....	5	125	
Red shale.....	5	130	
Sandy shale.....	14	144	
Limestone, dark gray.....	1	145	
Sandstone	8	153	153
Monongahela Series (187')			
Fire clay (Waynesburg coal).....	2	155	
Red shale.....	20	175	
Sandstone, buff, (Gilboy).....	30	205	
Red shale, limestone nodules.....	25	230	
Sandstone, friable, coarse, Uniontown....	25	255	
Red limy shale mixed with sandy shale.	25	280	
Sandstone, friable, buff, (Arnoldsburg)...	20	300	
Sandy shale.....	10	310	
Red limy shale.....	10	320	
Sandstone, conglomeratic, (Rock Creek)			
680' A. T.....	20	340	187'

The following section was measured with aneroid descending into Guyan creek from Union Ridge, Union district.

Union Ridge Section, Union District.

	Thickness. Feet.	Total. Feet.	
Dunkard Series (44')			
Sandstone, massive, coarse, Waynesburg.	44	44	44'
Monongahela Series (301')			
Fire clay, (Waynesburg coal).....	1	45	
Dark red shales.....	45	90	
Sandstone, dark, (Gilboy).....	20	110	
Red and sandy shale.....	10	120	
Sandstone, friable.....	20	140	
Red shale.....	10	150	
Sandstone, buff.....	20	170	
Red and sandy shale.....	20	190	
Sandstone, massive, (Uniontown).....	55	245	
Red limy shale.....	5	250	
Sandstone, flaggy.....	30	280	
Red limy shale.....	20	300	
Sandstone, massive, (Pittsburgh).....	40	340	
Slate (Pittsburgh coal horizon).....	5	345	301'

Porter Knob is a high point near the southern boundary of Cabell county and extends to the base of the Dunkard



Sketch showing approximate area of Pittsburg, Upper Freeport and No. 2 Gas coal in Cabell, Lincoln and Wayne Counties.

Fig. 4.

series. The following interesting section was measured with aneroid descending south to the head of Trace creek of Mud river:

Porter Knob Section, Grant District.

	Thickness Feet.	Total Feet.	
Monongahela Series (245')			
Sandy shale and concealed.....	11	11	
Red shale.....	2	13	
Sandy shale, sandstone and concealed (Gilboy)	48	61	
Sandstone, massive and concealed.....	20	81	
Red limy shale.....	3	84	
Sandstone, massive, buff (Uniontown)...	36	120	
Dark red shale.....	8	128	
Sandstone and sandy shale.....	32	160	
Limy red shale.....	10	170	
Sandstone and sandy shale.....	5	175	
Light red limy shale.....	10	185	
Sandstone, massive, conglomeratic, friable, (Pittsburgh).....	55	240	
Dark red limy shale.....	5	245	245'
Conemaugh Series (180')			
Sandy shale and sandstone, (Lower Pittsburgh)	35	280	
Dark red limy shale.....	1	281	
Limestone, impure, yellowish gray, nodular	5	286	
Red shale.....	4	290	
Sandstone, massive.....	13	303	
Fire clay.....	1	304	
Limestone, hard, fairly pure, blue and yellowish, (Clarksburg).....	6	310	
Sandy shale.....	15	325	
Sandstone, massive, coarse.....	35	360	
Green shale.....	5	365	
Sandstone, massive, friable, (Morgantown)	55	420	
Green shale to 720' A. T.....	5	425	180

The following section was measured with aneroid descending hill from the south to Dry creek, 2 miles southwest of Milton:

Dry Creek Section, Grant District.

	Thickness Feet.	Total Feet.	
Dunkard Series (45')			
Sandy shale and concealed, (Waynes- burg)	45	45	45'
Monongahela Series (290')			
Red limy shale.....	10	55	

	Thickness Feet.	Total Feet.	
Sandstone, sandy shale and concealed..	25	80	
Red limy shale.....	5	85	
Sandstone, massive, and sandy shale.....	25	110	
Red limy shale.....	10	120	
Sandstone, massive, fine grained.....	10	130	
Sandy shale.....	5	135	
Greenish shale.....	2	137	
Dark red shale.....	8	145	
Sandstone, massive, medium coarse, (Union- town)	15	160	
Red limy shale.....	10	170	
Sandstone, massive and flaggy, (Union- town)	21	191	
Sandy shale.....	10	201	
Fire clay, (Uniontown coal horizon).....	1	202	
Red limy shale.....	3	205	
Sandstone, massive, friable, Arnoldsburg.	40	245	
Sandy and red shales mixed.....	25	270	
Red limy shales.....	10	280	
Sandstone and concealed, (Pittsburgh)....	54	334	
Fire clay, (Pittsburgh coal).....	1	335	290'
Sandstone and concealed to 670' A. T.....	40	375	

The following section was measured with aneroid descending into Fudges creek, one mile north from Fudges, Grant district:

Fudges Creek Section, Grant District.

	Thickness Feet.	Total Feet.	
Dunkard Series (35')			
Sandy shale and concealed, (Waynesburg)	35	35	35'
Monongahela Series (235')			
Red limy shale.....	10	45	
Sandy shale and sandstone.....	15	60	
Red limy shale.....	3	63	
Sandstone, massive, coarse, friable	22	85	
Dark red, limy shale.....	5	90	
Sandy shale.....	5	95	
Sandstone, rather massive, (Uniontown)...	45	140	
Greenish red limy shale.....	20	160	
Sandstone, massive, coarse.....	44	204	
Greenish shale.....	1	205	
Red limy shale.....	15	220	
Dark red limy shale.....	5	225	
Sandstone, massive, (Pittsburgh), 815' A. T.	45	270	235'

The following section was measured with aneroid descending along the Hamlin and Huntington Turnpike from the northeast side of Heaths creek:

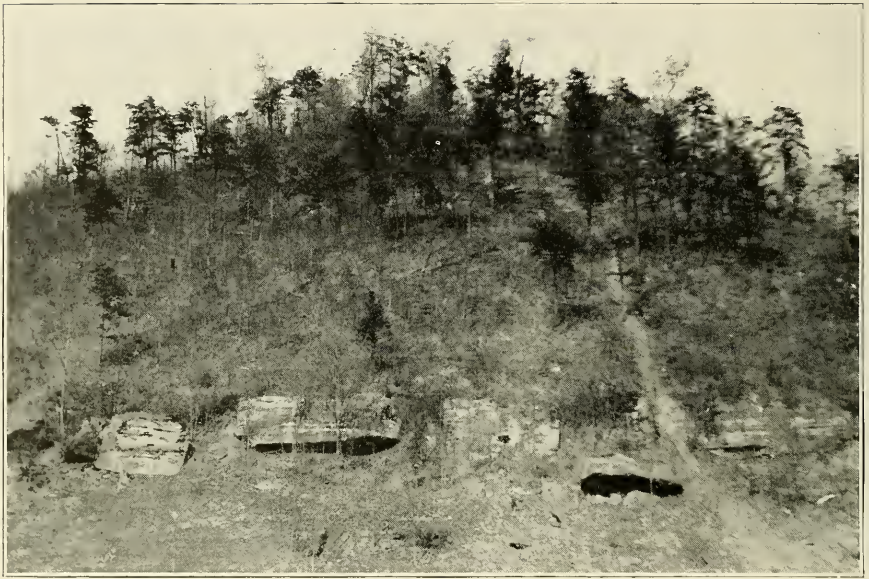


PLATE XI.—Outcrop of the “Pittsburgh” Sandstone on Cabell Creek,
Cabell County.

Heaths Creek Section, McComas District.

	Thickness	Total	
	Feet.	Feet.	
Monongahela Series (215')			
Sandstone, massive, coarse, (Uniontown)	35	35	
Sandy shale	15	50	
Dark red limy shale.....	5	55	
Sandy shale, sandstone and concealed, (Arnoldsburg)	45	100	
Dark red limy shales.....	40	140	
Broken sandstone, (Pittsburgh).....	70	210	
Coal and slate (Pittsburgh coal).....	5	215	215'
Conemaugh Series (170')			
Red and sandy shale.....	10	225	
Shale and fire clay.....	5	230	
Sandy shale and concealed.....	24	254	
Fire clay (Little Pittsburgh coal horizon)	1	255	
Yellowish shale.....	10	265	
Red shale.....	5	270	
Sandy shale and sandstone.....	22	292	
Dark red limy shale.....	5	297	
Sandstone, friable, Connellsville.....	27	324	
Fire clay, (Clarksburg coal).....	1	325	
Red sandy shale.....	20	345	
Sandstone, (Morgantown) to 551' A. T....	40	385	170'

The following section was measured with aneroid descending into Bowen creek, from the north, $2\frac{1}{2}$ miles southeast of Winslow:

Bowen Creek Section, McComas District.

	Thickness	Total	
	Feet.	Feet.	
Monongahela Series (222')			
Sandy shale.....	10	10	
Sandstone and concealed, (Gilboy).....	55	65	
Fire clay and red shale.....	5	70	
Sandy shale.....	10	80	
Sandstone, friable, (Uniontown).....	25	105	
Red sandy shale.....	27	132	
Fire clay (Uniontown coal horizon).....	1	133	
Sandstone and sandy shale, (Arnoldsburg)	22	155	
Red limy shale.....	5	160	
Sandstone, massive, friable, coarse, Pitts- burgh	35	195	
Red limy shale and fire clay.....	22	217	
Fire clay (Pittsburgh coal).....	5	222	222'
Conemaugh Series (163')			
Sandstone, (Lower Pittsburgh).....	30	252	
Limy and red shale.....	20	272	
Sandstone, massive, conglomeratic, (Up- per Connellsville)	45	317	
Fire clay and sandy shale.....	5	322	
Sandstone, flaggy, (Connellsville, Lower) to 730' A. T.....	63	385	163'

The following section was measured with aneroid descending to head of Toms creek from the east, 2 miles north of Inez:

Toms Creek Section, McComas District.

Monongahela Series (282')	Thickness Feet.	Total Feet.
Sandy shale and concealed.....	11	11
Sandstone, massive, coarse, friable, (Gil- boy)	43	54
Dark red limy shale and limestone.....	5	59
Sandstone, massive, coarse, friable, (Un- iontown)	60	119
Red limy shale.....	6	125
Sandstone, flaggy.....	11	136
Dark red shale.....	11	147
Sandstone, massive, friable, coarse, (Ar- noldsburg)	55	202
Red limy shale.....	16	218
Sandstone, massive.....	15	233
Dark shale, (Redstone coal horizon).....	1	234
Sandstone, massive, coarse, Pittsburgh...	45	279
Coal, Pittsburgh.....	3	282
		282'

South of Huntington in Guyandot district, the Monongahela series caps the high hills as is shown in the following interesting section measured with aneroid, descending along Wayne Turnpike from the south:

Huntington Section, Guyandot District.

Monongahela Series (80')	Thickness Feet.	Total Feet.
Red limy shales.....	20	20
Sandstone, coarse, conglomeratic, friable (Pittsburgh)	55	75
Coal and slate (Pittsburgh).....	5	80
Conemaugh Series (329')		
Dark red limy shale.....	65	145
Sandy shale and sandstone, (Connellsville)	35	180
Red limy shale.....	20	200
Sandy shale.....	8	208
Red limy shale.....	12	220
Sandstone, massive coarse	25'	} Morgantown.. 65 285
Sandy shale.....	10	
Sandstone, coarse friable	30	
Coal and slate, (Elk Lick).....	2	287
Sandy shale and concealed.....	45	332
Limestone, impure.....	2	334

	Thickness Feet.	Total Feet.	
Sandy shale	15	349	
Sandstone and concealed.....	48	397	
Limestone, impure, fossiliferous (Ames)	2	399	
Coal and slate, (Harlem).....	1	400	
Red shale, fossiliferous.....	7	407	
Limestone, impure, (Ewing).....	2	409	329'
Saltsburg sandstone, to 550' A. T.			

The Ames limestone is filled with its characteristic marine fossils at this locality, while the Harlem coal comes immediately below.

LINCOLN COUNTY SECTIONS (Monongahela Series).

The Monongahela series caps the highest hills in the northern portion of Lincoln county, and a few sections from that region will now be given.

Sugar Camp Knob is a high point $3\frac{1}{2}$ miles west of MacCorkle, where the following section was measured with aneroid descending into Eli fork of Cobbs creek, Washington district:

Sugar Camp Knob Section, Washington District.

	Thickness Feet.	Total Feet.	
Monongahela Series (60')			
Red shales.....	10	10	
Sandstone, massive, coarse.....	48	58	
Coal, Pittsburgh, opening fallen in, re-reported thickness	2	60	60'
Conemaugh Series (395')			
Red limy shale.....	70	130	
Concealed	40	170	
Sandstone, massive, coarse, (Connellsville)	35	205	
Red and sandy shale.....	25	230	
Sandstone, flaggy, (Morgantown).....	40	270	
Red shale	10	280	
Sandstone, buff, massive, coarse, (Grafton)	50	330	
Sandy shale and concealed.....	28	358	
Limestone, dark, (Ames).....	2	360	
Sandstone	45	405	
Sandy shale.....	30	435	
Sandstone, ferruginous.....	18	453	
Coal and slate (Bakerstown).....	2	455	395'

The above section shows the Pittsburgh sandstone cap-

ping the knob. The Pittsburgh coal was once mined along the road on the east side of the knob, but the opening had fallen in and no measurement of the coal could be taken.

The Lower Pittsburgh sandstone caps the highest hills on the head of Valley Fork north of Griffithsville, as is shown in the following section measured with aneroid descending from the north into Valley Fork, one mile and a half north of Griffithsville:

Valley Fork Section, Duval District.

	Thickness Feet.	Total Feet.
Conemaugh Series (405')		
Sandstone, coarse, conglomeratic, Lower		
Pittsburgh	33	33
Fire clay, (Little Pittsburgh coal horizon) ..	2	35
Red limy slate.....	60	95
Sandstone, flaggy, (Connellsville).....	30	125
Red limy slate and sandy shale.....	50	175
Sandstone, massive, buff, (Morgantown)..	50	225
Red limy shale.....	8	233
Limestone, light gray, (Elk Lick).....	2	235
Sandy shale.....	20	255
Sandstone, coarse, (Grafton).....	38	293
Red shale and fire clay.....	3	296
Limestone, (Ames horizon).....	2	298
Dark red shales.....	17	315
Sandstone	5	320
Red shale.....	5	325
Sandstone, buff, friable.....	10	335
Dark red shale with limestone nodules...	5	340
Dark yellow limy shale.....	10	350
Sandstone, flaggy, (Saltsburg).....	18	368
Fire clay, (Bakerstown coal horizon)....	2	370
Sandstone, (Buffalo) current bedded to		
725' A. T.....	35	405
		405'

The following section was measured with hand-level descending into Raccoon creek of Trace fork of Mud river from the north, $2\frac{1}{2}$ miles southwest of Ball Gap:

Raccoon Creek Section, Carroll District.

	Thickness. Feet.	Total. Feet.
Conemaugh Series (422')		
Sandstone, coarse, friable...	98	98
Sandstone, coarse, conglomeratic		
Concealed	2	100
Sandstone, coarse, buff, friable (Connells-ville)	58	158
Dark red limy shales.....	19	177
Sandstone, medium fine grained.....	14	191
Dark limy shale.....	2	193
Red shale.....	14	207
Sandstone	18	225
Sandy shale.....	6	231
Sandstone, coarse, buff, massive, (Morgantown)	66	297
Red shale and fire clay.....	10	307
Limestone, dark, magnesian, (Elk Lick)	1	308
Red shale	10	318
Limestone, dark yellowish, (Upper Ames)	2	320
Red shale	2	322
Sandstone, flaggy	10	333
Red shale.....	2	335
Limestone, dark (Lower Ames).....	2	337
Red limy shale.....	10	347
Sandstone, flaggy..... 3' }	29	376
Sandstone, massive, coarse micaceous, buff..... 26 }		
Dark shale with limestone.....	8	384
Sandy shale	4	388
Sandstone, flaggy..... 11' }	33	421
Sandstone, coarse, conglomeratic		
Fire clay, (Brush Creek coal) to 605' A. T.	1	422
		422'

WAYNE COUNTY (Monongahela Series).

The full thickness of the Monongahela series cannot be given in Wayne county, as only a portion of the series is represented throughout the northern part of the county in the great Parkersburg Syncline, so no sections will be given here, but will be given later in the Conemaugh series.

The foregoing sections of the Monongahela series of rocks in Cabell, Wayne and Lincoln counties show these measures to vary in thickness from 240 to 300 feet.

DESCRIPTION OF THE FORMATIONS OF THE MONONGAHELA SERIES.

The following formations are included in the Monongahela series of the Cabell-Wayne-Lincoln area:

Waynesburg Coal.
Gilboy Sandstone.
Uniontown Sandstone.
Uniontown Coal.
Uniontown Limestone.
Arnoldsburg Sandstone.
Lower Uniontown Coal.
Sewickley Sandstone.
Redstone Coal.
Upper Pittsburgh Sandstone.
Pittsburgh Coal.

The Waynesburg Coal.

The Waynesburg coal has no great commercial value even where it reaches its maximum thickness in the northern part of the State in Marion and Monongalia counties, since the coal is always high in ash and moisture and consequently, a poor steam coal.

This bed is thin or absent throughout Putnam and Mason counties and in the Cabell-Wayne-Lincoln area its horizon only occurs in northern Cabell where it is represented by fire clay and frequently by a thin layer of **black slate**.

The Gilboy Sandstone.

From 5 to 10 feet under the Waynesburg coal we often find a very hard, medium fine grained, grayish white sandstone which is very seldom conglomeratic, and often forms bold cliffs. This sandstone, which appears to correlate with the Gilboy of the northern portion of the State, is only found in northern Cabell county, where it occurs from 10 to 30 feet under the Waynesburg coal horizon.

The Uniontown Sandstone.

From 10 to 30 feet below the Gilboy sandstone there often occurs another sandstone, the **Uniontown**, named from Uniontown, Pennsylvania, where it overlies the Uniontown coal. In the area under discussion this sandstone varies in thickness from 20 to 40 feet and is frequently massive, forming bold cliffs in the northern part of Cabell county where it occurs.

The Uniontown Coal.

At an interval of 75 to 125 feet below the Waynesburg bed there often appears a bed of coal which has been termed the **Uniontown coal** from its occurrence near the city of that name in Pennsylvania.

In the Cabell-Wayne-Lincoln area the horizon of this coal occurs throughout the northern part of Cabell county and is represented either by a stratum of fire clay or a bed of black slate, and no coal appears to be present at this horizon.

The Uniontown Limestone.

The limestone that occurs between the Uniontown and the Sewickley coals in the northern part of the State, appears to be almost entirely absent in the area described and to be displaced by red and sandy shales.

The Arnoldsburg Sandstone.

From 30 to 50 feet below the Uniontown sandstone there is a gray, rather coarse-grained sandstone, which has been named by Ray V. Hennen, the **Arnoldsburg sandstone**, from Arnoldsburg, Calhoun county, where it is quarried for building purposes. In the Cabell-Wayne-Lincoln area this sandstone is from 25 to 40 feet thick and it forms steep bluffs and often cliffs where it occurs in Cabell county.

Lower Uniontown Coal.

There often occurs a thin layer of fire clay at the base of

the Arnoldsburg sandstone in the Cabell-Wayne-Lincoln area, which no doubt is the horizon of the Lower Uniontown coal, found in the northern part of the State.

The Redstone Coal.

In the northwest part of Cabell county there appears occasionally a stratum of black slate from 1 to 2 feet in thickness at 30 to 50 feet above the Pittsburgh coal horizon, which possibly represents the Redstone coal. More frequently the Upper Pittsburgh sandstone displaces this bituminous slate and no trace of it can be found.

The Upper Pittsburgh (Pomeroy) Sandstone.

The Upper Pittsburgh (Pomeroy) sandstone, overlying the Pittsburgh coal occurs throughout Cabell county, the northern part of Lincoln where it caps the tops of the highest hills, and throughout a portion of the northern part of Wayne county. The bed is a massive, coarse-grained grayish white sandstone often conglomeratic and varies in thickness from 40 to 80 feet. It is persistent and since it does not disintegrate readily, it forms steep bluffs, and its outcrop is frequently marked with massive, projecting cliffs from which large boulders have often separated from the main stratum, and rolled down the hillsides to the bottoms along the beds of the streams.

Certain layers of this sandstone quarry fairly well and are used as a building stone. This sandstone crops out either in steep bluffs or abrupt cliffs along the hills facing the Ohio river from the northern boundary line of Cabell county, where it occurs 100 feet above the B. & O. Railroad grade, to a point opposite Huntington in Cabell county where it caps the highest hills about 450 feet above the level of the Ohio.

Massive cliffs 40 to 50 feet high formed by this sandstone crop along the hillsides of Seven Mile and Nine Mile creeks in Union district, Cabell county, until the bed is no longer exposed, but passes under the level of the creek.

It is this bed of sandstone that forms the cliffs along the

tributaries of Mud river in Grant and Union districts in Cabell county, where these cliffs are from 30 to 60 feet high and are rugged and massive.

This sandstone occurs on the head of Two Mile creek, in Grant district, where it is nearly 70 feet thick. It caps the hills in northern Lincoln county, along the Lincoln-Putnam line where the base is 400 to 500 feet above the level of the valley and the bed is 40 feet thick, massive and conglomeratic.

The Upper Pittsburgh sandstone also caps the hills south of the Guyandot river where it occurs on the head of Hollins branch southwest of Martha, Barboursville district, Cabell county, in a ledge 45 feet high, the base of this being 790 feet above tide. It caps the high knob $\frac{1}{2}$ mile north of Johnson, McComas district, where the base occurs at 1125 feet above tide. The ledge here is 40 feet thick and is conglomeratic.

This sandstone caps the hills $2\frac{1}{2}$ miles northeast of Hubbardstown, Butler district, and is 40 feet in thickness. It also caps Sugar Camp Knob in Washington district, Lincoln county, where its base is 1240 feet above tide, and the ledge is 60 feet thick.

This sandstone also caps the hills on the divide between the waters of Newcomb creek and the waters of White creek, Ceredo district, Wayne county.

The Pittsburgh Coal.

The Pittsburgh coal, the lowest formation of the Monongahela series, is also the most valuable and important from an economic standpoint. In the Cabell-Wayne-Lincoln area it has no great commercial value, since it is thin and present in only a portion of the northern part of the area. The coal usually occurs just at the base of a massive sandstone, and quite frequently has no slate covering between it and the Upper Pittsburgh sandstone. This coal is mined in a great many places throughout the area for local fuel, where it is transported in wagons to the farmers' homes, but nowhere in the area is it mined and shipped by either rail or water.

Sections illustrating its structure, character, and thickness will now be given by districts in the area under discussion.

CABELL COUNTY—Pittsburgh Coal.

The Pittsburgh coal horizon occurs in the Ohio river hills at about 150 feet above the level of the Ohio river in the northern part of Cabell county along the Cabell-Mason line, and gradually rises as the Ohio takes its course to the southwest until south of Huntington the coal occurs in the hills from 420 to 450 feet above the level of the Ohio.

Eastward from Huntington, along the C. & O. Railroad main line the Pittsburgh coal gradually dips into the great Parkersburg Syncline $2\frac{1}{2}$ miles west of Milton where it appears in a railway cut. Thence it gradually rises to the south and east until its horizon at the Cabell-Putnam line is from 75 to 100 feet above the C. & O. Railroad grade.

Along the Guyandot Branch of the C. & O. Railroad on the Guyandot river, the Pittsburgh coal rises gradually out of the Parkersburg Syncline at a point south of Martha where this syncline crosses the Guyandot river, until on the hills east of West Hamlin its horizon comes 400 feet above the C. & O. Railroad grade.

Union District—Pittsburgh Coal Openings.

The Pittsburgh coal has never been opened for mining purposes in Union district, but the coal crop was found exposed at two different places along the Ohio river front.

Exposure No. 1 is located N 82° E, $2\frac{1}{2}$ miles from Crown City Ferry, at an elevation of 660 feet A. T. aneroid, and the crop shows a seam from 12 to 18 inches thick with a small slate parting.

Exposure No. 2 is located N 42° E, one-fourth mile from Crown City Ferry in the field owned by Jenkins et al., where the bed has been opened, and shows coal and slate mixed, 2 feet. The coal was not fully exposed and faced up. However, this opening seems to indicate that the Pittsburgh bed is thin and impure throughout this part of the county.

Barboursville District—Pittsburgh Coal.

Opening No. 3 is located S 55° E one mile and a quarter from Cox Landing along Seven Mile creek on the land of Charles Hencehkohn, where the coal is mined for fuel purposes by Wm. Short. The following section was measured there:

Section of Wm. Short's Coal Opening.

			Ft.	In.
Sandstone				
Slate			1	3
Coal	0'	6"	4	6
Slate	1	0		
Coal, hard....	3	0		
Slate floor.				
Elevation, 705' A. T. Aneroid.				

Opening No. 4 is located S 53° E, one mile and a half from Cox Landing along Seven Mile creek on lands of Charles Hencehkohn, being now mined here by George Harkins. The coal has been operated at this opening for more than 20 years for local fuel use, and transported away from the mine by wagons. The main heading has been driven in the hill for about 400 feet.

The following section was measured at the face of this heading:

Section of George Harkins' Coal Opening.

			Ft.	In.
Sandstone...				
Slate		1" to 0		3
Coal	0'	8"	4	8
Slate	1	0		
Coal, hard....	3	0"		
Slate floor.				
Elevation, 700' A. T. Aneroid.				

The coal is hard, coming out in large lumps, and appears to be a good fuel coal.

Opening No. 5 is located S 62° E 2½ miles from Cox Landing on the head of Seven Mile creek. This is an old abandoned opening and shows the following section:

Section of Seven Mile Creek Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal and slate.....	3	0
Elevation, 700' A. T. Aneroid.		

The coal is badly laminated with slate so that it appears very impure and of little commercial value.

Opening No. 6 is located S 40° E one mile and a quarter from Cox Landing along the waters of Little Seven Mile creek on the land of Lewis Wintz, where the coal is mined for local fuel use by Mr. Wintz, and exhibits the following structure:

Section of Lewis Wintz' Coal Opening.

	Ft.	In.
Slate roof.....		
Slate and coal mixed..1' 0" }	4	0
Coal, hard, blocky....3 0 }		
Fire clay bottom. Elevation 700' A. T. Aneroid.		

The coal mines in large blocks and has a bright, rich appearance.

Opening No. 7 is located S 41° E one mile and a half from Cox Landing along Little Seven mile creek on land of Lewis Wintz about one-quarter mile east from opening No. 6. Coal was formerly mined here, but the opening is now abandoned. The coal is reported to have about the same section as it has in Opening No. 6.

Opening No. 8 is located N 27° E 2½ miles from Barbourville along the waters of Wild Cat branch of Mud river, on the land of John Clark, where it is mined for local fuel use, and where the following section was measured:

Section of John Clark's Coal Opening.

	Ft.	In.
Slate and fire clay.....		
Interlaminated coal and slate..0' 6" }	3	0
Coal, hard, blocky.....2 6 }		
Fire clay floor, 720' A. T. Aneroid.		

Grant District—Pittsburgh Coal Openings.

Opening No. 11 is located along Fudges creek S 51° W, 4½ miles from Milton on the land of John Childers, where the coal is mined for local fuel use, and the following section was measured:

Section of John Childers' Coal Opening.

		Ft.	In.
Fire clay or slate roof.....			
Coal, soft.....	1' 0 "		
Slate	0 ½		
Coal, good.....	0 3½		
Soft, blue fire clay...0	4	2	9
Coal	0 1		
Fire clay.....	0 2		
Coal, laminated.....	0 10		
Elevation, 720' A. T. Aneroid.			

Opening No. 12 is located S 38° W, 4¾ miles from Milton along Fudges creek on the land of H. L. Beckett, where it is mined for local fuel use, and the following section was measured:

Section of H. L. Beckett's Coal Opening.

	Ft.	In.
Slate, roof.....		
Coal, hard.....		13
Fire clay.....	3	0
		750' A. T. Aneroid

Mr. Beckett reports that the coal was 3 feet thick in an abandoned opening near this one, but it had caved in and no measurements could be taken.

Guyandot District—Pittsburgh Coal Openings.

Opening No. 13 is located on the hill in the southern city limits of Huntington, where the coal was once mined on the land of C. A. Reid and hauled in wagons to Huntington for local fuel. The opening is abandoned and has caved in, so it was impossible to get a section of same, but it was reported to be 3 to 4 feet thick, at an elevation of 900' A. T.

Opening No. 14 is located on the hill in the southern city limits of Huntington on the land of Henry Kyle, where it was once mined for domestic use. The opening is now abandoned, but the coal is reported to be 3 feet thick.

McComas District—Pittsburgh Coal Openings.

Opening No. 15 is located S 16° W, 4 miles from Barbourville, along the Hamlin and Huntington Turnpike on the land of Peter Wagoner, where it is mined for local use, and the following section was measured:

Section of Peter Wagoner's Coal Opening.

		Ft.	In.
Slate roof.....			
Coal	1' 10"	}	4 8
Slate, bituminous.....	10		
Coal, hard, blocky.....	2 0		
Slate from 790' A. T. Aneroid.			

The lower part of this seam appears to be of very good quality and makes an excellent fuel coal.

Opening No. 16 is located on Hollins Branch S 17° W, 3 miles from Barbourville, where the coal has been mined, and the following section was measured:

Section of Hollins Branch Coal Opening.

		Ft.	In.
Sandstone			
Coal and slate.....	0' 6"	}	2 0
Coal, hard.....	1 6		
Elevation, 790' A. T. Aneroid.			

Opening No. 17 is located S 64° E, 3¾ miles from Barbourville along the waters of Toms creek, where the coal has been opened by Silas Whitley and the section shows the following:

Section of Silas Whitley's Coal Opening.

	Ft.	In.
Slate and fire clay roof.....		
Coal, hard, blocky.....		18
Slate floor, elevation, 725' A. T. Aneroid.		

Opening No. 18 is located S 52° E, $5\frac{3}{4}$ miles from Barboursville and about $\frac{1}{2}$ mile southeast from Roach, where coal was once mined at an elevation of 800' A. T. Aneroid, but is now abandoned, although reported as 2 to 3 feet thick.

Opening No. 20 is located S 3° W $5\frac{1}{2}$ miles from Barboursville along the waters of Heath creek on the land of Mr. J. H. Johnston, where the coal was once mined for local fuel use, but the mine is now abandoned. The following section was measured there:

Section of J. H. Johnston's Coal Opening.

		Ft.	In.
Sandstone			
Slate			8
Coal and slate.....	6"	4	8
Bituminous shale.....	10		
Coal, gas, soft.....	10		
Slate	10		
Coal hard, blocky.....	1' 8		
Fire clay floor, elevation 725' A. T. Aneroid.			

Opening No. 21 is located S 75° W, $5\frac{1}{2}$ miles from West Hamlin on a high point east of J. H. Johnston's along the waters of Raccoon creek, where the coal has been mined for local fuel use by Robert J. Adkins, and the following section was measured at his abandoned mine:

Section of Robert J. Adkins' Coal Opening.

		Ft.	In.
Sandstone, massive, coarse.....			
Coal, hard, blocky.....	2' to 3	0	
Fire clay floor, elevation, 1125' A. T. Aneroid.			

Opening No. 22 is an abandoned opening located N 87° W, $5\frac{1}{4}$ miles from West Hamlin along the waters of a branch emptying into Beech Fork, at an elevation of 910' A. T. Aneroid.

LINCOLN COUNTY—PITTSBURGH COAL.

The Pittsburgh coal horizon covers a very small portion of the northern part of Lincoln county in Washington district, and possibly a few of the highest knobs in Duval dis-

trict, but at no place is the coal opened where a section could be measured.

WAYNE COUNTY—PITTSBURGH COAL.

The Pittsburgh coal is found in the tops of the hills throughout the northern part of Wayne county where the strata dip into the Parkersburg Syncline. Sections will now be given showing the character and thickness of this bed in that region.

Union District—Pittsburgh Coal.

Opening No. 23 is located S 81° W, 6½ miles from Salt Rock along the waters of Adkins Branch on the land of David Bowen, where the following section was measured:

Section of David Bowen's Coal Opening.

	Ft.	In.
Sandstone, massive.....		
Shale and slate.....	2	0
Coal, rather hard.....	2	0
Slate and fire clay.....	1	0
Elevation. 795' A. T. Aneroid.		

Opening No. 24 is located S 78° W, 6¾ miles from Salt Rock and one-fourth mile south of Bowen along the waters of Beech Fork on the land of John Parson, at an elevation of 795' A. T. Aneroid, but the opening had fallen in and no section could be measured.

Opening No. 25 is located S 81° E, 4¾ miles from Dickson and along the waters of Spurlock Branch on the land of Samuel Osborne, where the following section was measured:

Section of John Osborne's Coal Opening.

	Ft.	In.
Sandstone		
Slate	1	0
Coal, rather hard.....1' 6" }		
Slate	0	1
Coal	1	0
Slate	0	9
Coal, rather hard.....1 6 }		
Slate floor, elevation, 820' A. T. Aneroid.		

Opening No. 26 is located S 79° E, $4\frac{1}{4}$ miles from Dickson and along the head of Reuben Branch on W. C. Blankenship's land, where the following section was measured:

Section of W. C. Blankenship's Coal Opening.

			Ft.	In.
Sandstone				
Shale	2'	0"	3	4
Coal, blocky	0	11		
Slate	0	10		
Coal	1	8		
Slate floor, elevation, 820' A. T. Aneroid.				

Opening No. 27 is located S 79° E, 5 miles from Dickson along the waters of Booten branch of Millers fork on the land of Randolph Workman, where a local mine has been abandoned at 820' A. T. Aneroid.

Opening No. 28 is located S 67° E, $4\frac{1}{4}$ miles from Dickson along the waters of Booten branch of Millers fork on the land of Sylvester Aliff, where the coal is mined for domestic fuel, and the following section was measured:

Section of Sylvester Aliff's Coal Opening.

			Ft.	In.	
Sandstone					
Slate			1	6	
Coal, gas, soft.....	1'	8"	6	0	
Slate	0	6			
Coal, hard.....	0	6			
Slate and fire clay (8"-20")	1	4			
Coal, hard, blocky.....	2	0			
Elevation, 840' A. T. Aneroid.					

Opening No. 29 is located N 59° E, $\frac{3}{8}$ of a mile from Lavalette on the land of J. W. Graham, where the coal is mined for local fuel. The following section was measured in said opening:

Section of J. W. Graham's Coal Opening.

			Ft.	In.
Sandstone				
Coal, hard, blocky...	2'	0"	4	4
Slate	10			
Coal, soft.....	1	6		
Fire clay floor, elevation, 875' A. T. Aneroid.				

Opening No. 30 is located S 75° W, 4 miles from Salt Rock along the waters of Glass Lick, but has been abandoned and no measurement could be taken.

Opening No. 31 is located N 87° W, 4¾ miles from Salt Rock along the waters of Glass Lick branch on the land of Luther Keyser, where the coal is mined for local use, and the following section was measured:

Section of Luther Keyser's Coal Opening.

			Ft.	In.
Sandstone				
Slate			0	8
Coal and slate.....	0'	6"	5	6
Bituminous shale.....	0	10		
Coal, gas, soft.....	1	0		
Slate	0	10		
Coal, hard, blocky...	1	10		

Butler District—Pittsburgh Coal Openings.

Opening No. 32 is located S 21° E, 1¾ miles from the mouth of Whites creek on the lands of C. C. Cyrus, where the following section was measured:

Section of C. C. Cyrus' Coal Opening.

	Ft.	In.
Sandstone roof.....		
Slate		
Coal and slate.....		
	30.	Elevation
	915'	A. T. Aneroid

Opening No. 33 is located S 24° E, 3 miles from the mouth of Whites creek on the lands of Reuben Thacker, Gragston creek, where the following section was measured:

Section of Reuben Thacker's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Slate	0	2
Coal, clean.....	2	4
Slate floor, elevation, 915' A. T. Aneroid.		

The foregoing measurements of the Pittsburgh coal bed taken at different points where the coal is opened, indicate that

this great bed so valuable in the northern part of West Virginia and through the southwestern part of Pennsylvania has greatly thinned and deteriorated in the southwestern part of West Virginia, so that it has small commercial value in Cabell, Wayne and Lincoln counties.

Samples of the coal have been collected from several of the above openings and analyses made by the chemists of the Survey. The results of the analyses will be published in a succeeding chapter, and the estimates of the available coal tonnage will also be given.

CHAPTER VI.

THE CONEMAUGH SERIES.

This group of stratified rocks between the floor of the Pittsburgh coal and the roof of the Upper Freeport coal is fully described by I. C. White in Vol. II, page 225, of the West Virginia Geological Survey reports, and also in the County Report by the writer on Jackson, Mason and Putnam, pages 188-191, to which volumes the reader is referred.

A few more sections, in addition to those already given in Chapter III, will now be submitted showing the rock succession in the Conemaugh series of the Cabell-Wayne-Lincoln area:

WAYNE COUNTY (Conemaugh Series).

The following section was measured with aneroid descending hill into Reuben branch and joined onto the A. W. Preston well (W-49) drilled by the Wayne Oil Company:

Reuben Branch Section, Union District.

	Thickness	Total	
	Feet.	Feet.	
Monongahela Series (181')			
Sandy shale and sandstone.....	30	30	
Red shale.....	5	35	
Sandstone	15	50	
Red shale and concealed.....	20	70	
Sandstone	15	85	
Red shale.....	5	90	
Sandstone	25	115	
Sandy shale.....	10	125	
Sandstone, massive, conglomeratic, medium coarse grained, (Upper Pittsburgh)	50	175	
Shale	2	177	
Coal, blocky.....0.9' }			
Slate .....0.9' }	Pittsburgh coal.. 3.5	180.5	
Coal, gas.....1.7' }			
Slate, visible.....	0.5	181	181'
Conemaugh, Allegheny, Pottsville, Mauch Chunk (1545')			
Concealed to top of boring, 735' A. T.....	105	286	

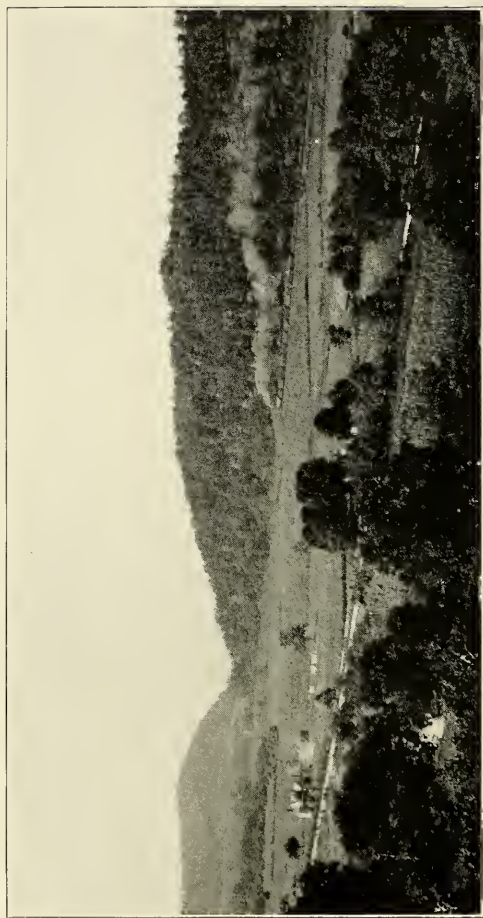


PLATE XII.—Guyandotte Valley, near Guyandotte, Showing Conemaugh Series.

	Thickness Feet.	Total Feet.	
Red rock and slate.....	193	479	
Lime	47	526	
Red rock	20	546	
Slate and lime.....	240	786	
Sand	25	811	
Slate	145	956	
Sand	65	1021	
Coal?	5	1026	
Brown slate.....	260	1286	
Unrecorded	55	1341	
Salt sand.....	140	1481	
Unrecorded	245	1726	1545'
Greenbrier Limestone (200')			
Big lime.....	200	1926	200'
Pocono Sandstones (159')			
Unrecorded	50	1976	
Big Injun sand.....	50	2026	
Unrecorded	59	2085	159'

The following section was measured with aneroid descending hill into Spurlock branch towards Bowen, Union district, Wayne county:

Bowen Section, Union District.

	Thickness Feet.	Total Feet.	
Monongahela Series (140')			
Sandstone	20	20	
Red limy shales.....	40	60	
Sandstone, friable.....	15	75	
Red shale	7	82	
Sandy shale and sandstone.....	6	88	
Red shale.....	22	110	
Sandstone, coarse grained.....	27	137	
Slate and coal, Pittsburgh.....	3	140	140'
Conemaugh Series (265').			
Sandstone	18	158	
Fire clay, Little Pittsburgh.....	2	160	
Sandy shale.....	20	180	
Sandstone, Upper Connellsville.....	45	225	
Red and sandy shale.....	15	240	
Sandstone, Lower Connellsville.....	10	250	
Red, limy shale mixed with sandy shale..	50	300	
Sandstone, massive, coarse grained, buff,			
Morgantown	67	367	
Slate and fire clay, (Elk Lick coal horizon)	1	368	
Limestone, dark gray, (Elk Lick).....	2	370	
Sandy shale and sandstone, Grafton....	355	4055	265'
Elevation, base of section, 595' A. T.			

The following section was measured with aneroid de-

scending along the road into the village of Shoals, Union district:

Shoals Section, Union District.

	Thickness Feet.	Total Feet.	
Monongahela Series (57')			
Sandstone, Upper Pittsburgh	55	55	
Fire clay, (Pittsburgh coal).....	2	57	57'
Conemaugh Series (298')			
Sandstone, Lower Pittsburgh	8	65	
Red limy shales.....	10	75	
Sandstone mixed with layers of red shale	30	105	
Red and sandy shale.....	25	130	
Sandstone, Upper Connellsville	15	145	
Limestone, gray, magnesian.....	1	146	
Limy shale.....	1	147	
Sandy shale.....	8	155	
Sandstone, upper part friable, lower part conglomeratic, Lower Connellsville	45	200	
Fire clay, Little Clarksburg	2	202	
Sandy shale.....	10	212	
Red limy shale.....	27	239	
Limestone, yellow.....	8	247	
Red limy shale.....	14	255	
Limestone, bluish yellow.....	5	260	
Red limy shales.....	5	265	
Sandstone, flaggy	5	270	
Red and sandy shale.....	45	315	
Red limy shale.....	15	330	
Concealed	15	345	
Sandstone, Grafton ? to 530' A. T. Aneroid	15	355	298'

The following section was measured descending hill three-quarters of a mile north of Lavalette at the mouth of Camp creek, Ceredo district:

Lavalette Section, Ceredo District.

	Thickness Feet.	Total Feet.	
Monongahela Series (115')			
Sandy shale	12	12	
Red shale	3	15	
Sandstone and concealed.....	12	27	
Red shale	3	30	
Sandstone and concealed.....	25	55	
Sandy shale and concealed.....	25	80	
Sandstone, pebbly for 10' at top, Upper Pittsburgh	33	113	
Fire clay, (Pittsburgh coal horizon).....	2	115	115'
Conemaugh Series (335')			
Sandy shale and concealed.....	10	125	

	Thickness Feet.	Total Feet.
Sandstone, hard, micaceous, Lower Pittsburgh , friable in lower half.....	35	160
Sandstone and sandy shale.....	30	190
Red shale	25	215
Sandy shale	5	220
Fire clay	2	222
Sandstone, stained with iron at top, fine grained Connellsville	63	285
Sandy shale	20	305
Sandstone, flaggy.....	20	325
Sandy shale and concealed.....	25	350
Sandstone, flaggy and shaly, Morgantown	60	410
Reddish shale and concealed.....	25	435
Limy shale, very fossiliferous, (Ames)..	5	440
Limy shale and fire clay (Harlem coal horizon)	5	445
Limestone, impure (Ewing).....	3	448
Sandstone to railroad track, 560' A. T.		
Aneroid	2	450 335'

The limy shale found at 325 feet below the Pittsburgh coal horizon is very rich in marine fossils and is undoubtedly at the horizon of the Ames limestone.

The following section was measured with aneroid one mile and a half north from Cyrus on the N. & W. R. R. near the 53rd Mile Post from Naugatuck, Ceredo district:

Cyrus Section, Ceredo District.

	Thickness Feet.	Total Feet.
Conemaugh Series (395')		
Sandstone, sandy shale and concealed...	50	50
Sandstone, massive, friable.....	10	60
Sandy shale	10	70
Red and green limy shales.....	5	75
Sandy shale and sandstone.....	40	115
Red limy shales.....	5	120
Sandy shale and sandstone (Grafton)....	50	170
Sandstone, conglomeratic, friable, Morgantown	80	250
Sandstone and concealed.....	35	285
Red and sandy shale.....	10	295
Sandstone, Saltsburg	20	315
Sandy limestone or limy sandstone, fossiliferous	5	320
Shales, dark bluish.....	15	335
Coal and fire clay, Bakerstown	7	342
Fire clay to N. & W. R. R. level.....	5	347
Limy shales	5	352
Red and sandy shales.....	8	360
Sandstone, shelly	5	365
Sandstone, Buffalo , to Big Sandy river bed, 510' A. T.....	30	395 395'

This is a very interesting section showing the different strata in the Conemaugh series. This section begins near the base of the Monongahela series and extends to the top of the Buffalo sandstone, thus making the thickness of the Conemaugh series over 500 feet.

The following section was measured with aneroid descending hill, a short distance south of Cyrus on Big Sandy river, near the mouth of Whites creek:

Whites Creek Section, Ceredo District.

	Thickness Feet.	Total Feet.	
Monongahela Series (58)			
Concealed	25	25	
Sandstone, massive conglomeratic.....	30	55	
Coal, Pittsburgh, about.....	3	58	58'
Conemaugh Series (362')			
Sandy shale and concealed.....	40	98	
Sandstone	10	108	
Limy red shale.....	22	130	
Sandstone and concealed, (Upper Connellsville)	15	145	
Red shales	10	155	
Concealed	15	170	
Sandstone, massive, (Lower Connellsville)	30	200	
Concealed	60	260	
Red shales with limestone nodules.....	10	270	
Sandstone, conglomeratic, friable.....	25	295	
Fire clay.....	2	297	
Concealed	33	330	
Sandstone, Saltsburg , (top portion fossiliferous)	15	345	
Fire clay	2	347	
Limestone, Pine Creek , fossiliferous, red beds and concealed.....	33	380	
Sandstone, massive, to bed of Big Sandy river, Buffalo , to 510' A. T.....	40	420	362'

The top portion of the Saltsburg sandstone is fossiliferous, having marine fossils.

Just north of Johnson in McComas district, Cabell county, is a very high knob capped with the Upper Pittsburgh sandstone underneath which the Pittsburgh coal has been mined. The following interesting section was measured with aneroid descending from this knob into Raccoon creek:

Johnson Section, McComas District.

	Thickness Feet.	Total Feet.	
Monongahela Series (45')			
Concealed	20	20	
Sandstone, massive, conglomeratic.....	22	42	
Coal, Pittsburgh.....	3	45	45'
Conemaugh Series (465')			
Sandy shale.....	10	55	
Sandstone and concealed.....	60	115	
Sandy shale.....	5	120	
Sandstone and concealed.....	105	225	
Red and sandy shale.....	41	266	
Limestone, dark, impure.....	2	268	
Sandy shale	2	270	
Sandstone, flaggy.....	11	281	
Sandy shale	2	283	
Limestone, dark, impure.....	3	286	
Sandy shale	7	293	
Limestone, grayish blue, magnesian....	2	295	
Sandy shale	10	305	
Sandstone, massive, coarse, (Saltsburg).	45	350	
Sandy shale and concealed.....	35	385	
Sandstone, Buffalo	40	425	
Sandy shale.....	15	440	
Sandstone, massive, (Mahoning).....	65	505	
Slate, (Upper Freeport coal horizon) to 655' A. T. Aneroid.....	5	510	465'

The above section was taken descending the hill towards the rise of the strata, which would increase the thickness of the Conemaugh series possibly 50 to 60 feet, thus making the entire thickness of the Conemaugh series 515 to 525 feet.

The following section was measured with aneroid descending hill into Cove Gap Post Office, Grant district, along the public road from the north:

Cove Gap Section, Grant District.

	Thickness Feet.	Total Feet.
Conemaugh Series (335')		
Red limy shale.....	10	10
Sandstone .....20' } Morgantown	40	50
Sandstone, coarse, pebbly .....20 }		
Red and sandy shale.....	40	90
Sandstone, coarse grained, buff, (Grafton).	34	124
Red limy shale.....	7	132
Limestone, dark gray, impure.....	3	135
Red and sandy shale.....	23	158
Limestone	2	160
Red shale	10	170

	Thickness Feet.	Total Feet.	
Sandstone	18	188	
Fire clay	2	190	
Sandstone	35	225	
Red and sandy shale.....	10	235	
Sandstone, Buffalo	48	283	
Fire clay, (Brush Creek).....	2	285	
Sandstone, ferruginous, Mahoning.....	50	335	335'
Allegheny Series (145')			
Coal and fire clay, (Upper Freeport).....	5	340	
Sandstone, massive.....	33	373	
Coal, slaty, Lower Freeport.....	2	375	
Sandstone, conglomeratic, Freeport.....	50	425	
Coal and slate.....	5	430	
Sandstone	50	480	145'
Coal and slate, "No. 5 Block"?.....			

The above section begins about 160 to 170 feet under the base of the Monongahela series which would make the Conebaugh about 500 feet thick at this point.

The following section was measured with aneroid descending hill into Wayne, Union district, Wayne county, from the west:

Wayne Section, Union District.

	Thickness Feet.	Total Feet.
Conemaugh Series (365')		
Sandstone and sandy shale.....	10	10
Red limy shale.....	5	15
Sandy shale and sandstone.....	35	50
Dark red shale.....	5	55
Sandstone, coarse, grained, micaceous, (Morgantown)	50	105
Red limy shale.....	5	110
Sandstone, flaggy	2	112
Red shale	3	115
Sandstone, flaggy, fine grained.....	10	125
Limestone and red limy shale.....	7	132
Sandstone, flaggy.....	8	140
Limestone, impure, nodular.....	3	143
Sandstone, friable	7	150
Limestone, nodular, impure, yellowish...	2	152
Sandstone, massive, (Grafton).....	18	170
Limestone, impure, large nodules, (Upper Ames)	3	173
Sandy shale	5	178
Sandstone, micaceous, massive coarse...	5	183
Limestone, gray, hard, nodular.....	4	187
Red limy shale.....	3	190
Sandstone, massive, rather coarse, Salts- burg	25	215

Sandy shale	10	225	
Sandstone	10	235	
Concealed	20	255	
Light red shale.....	20	275	
Limy shale	2	277	
Fire clay, dark, Brush Creek coal	3	280	
Sandstone, massive, med- ium, coarse grained, feriferous	40'	} Mahoning. 85	365
Sandstone, massive flaggy, 45'			
Allegheny Series (45')			
Coal and slate, (Upper Freeport)	3	368	
Sandy shale and sandstone, Freeport	22	390	
Coal blossom (Lower Freeport)	2	392	
Sandstone and concealed to 598' A. T.	18	410	45'

The above section begins about 130 to 140 feet below the base of the Monongahela series, which would make the thickness of the Conemaugh about 500 feet.

DESCRIPTIONS OF THE CONEMAUGH FORMATIONS.

The following are the principal formations included in the Conemaugh series in descending order:

Lower Pittsburgh Sandstone.
Pittsburgh Limestones.
Little Pittsburgh Coal.
Upper Connellsville Sandstone.
Lower Connellsville Sandstone.
Little Clarksburg Coal.
Clarksburg Limestone.
Morgantown Sandstone.
Elk Lick Coal.
Elk Lick Limestone.
Birmingham Shale.
Ames (Crinoidal) Limestone.
Harlem (Crinoidal) Coal.
Pittsburgh Red Shale.
Saltsburg Sandstone.
Bakerstown (Barton) Coal.
Pine Creek (Cambridge) Limestone.
Buffalo Sandstone.
Brush Creek Limestone.

Brush Creek Coal.
Upper Mahoning Sandstone.
Mahoning Coal.
Lower Mahoning Sandstone.

Lower Pittsburgh Sandstone.

From 5 to 10 feet under the Pittsburgh coal there frequently occurs a massive sandstone that has been named the Lower Pittsburgh sandstone from its proximity to the coal bed of that name.

In the Cabell-Wayne-Lincoln area this sandstone is often massive, coarse grained, and conglomeratic and from 10 to 50 feet in thickness. It caps some of the highest knobs in the northern part of Lincoln county and throughout a portion of Wayne as well as the southern part of Cabell county. It is this sandstone that forms massive cliffs along the waters of Mud river in Grant district, Cabell county. On the waters of Raccoon creek of Mud river it becomes 40 to 50 feet thick. In some places this sandstone is displaced with red shales and limestone.

The Pittsburgh Limestone.

There often occurs a gray, impure, limestone in the red shales which occasionally replace the Lower Pittsburgh sandstone, and this appears to correlate with the Pittsburgh limestone. It crops on the hill top N 45° W, 2½ miles from Myra, Carroll district, Lincoln county, and is there from 6 to 10 feet thick, dark gray, and magnesian. This limestone crops also on the head of Seven Mile creek, Union district, Cabell county, where it is from 3 to 5 feet thick, gray and impure. It is of little economic value except for farm use as a fertilizer, since it is generally very impure.

A sample of this limestone was collected from its crop near Myra, Lincoln county, and the analysis made of same in the laboratory of the West Virginia Geological Survey by Mr. J. B. Krak, Assistant Chemist, gives the following results:

Analysis of Lower Pittsburgh Limestone.

	Per cent.
Silica (Si O_2).....	30.96
Ferric Iron (Fe_2O_3).....	5.07
Ferrous Iron (FeO}).....	.....
Alumina (Al_2O_3).....	9.78
Calcium Carbonate (CaCO_3).....	47.04
Magnesium Carbonate (MgCO_3).....	2.20
Sulphuric Acid (SO_3).....	0.09
Phosphoric Acid (P_2O_5).....	0.13
Loss on ignition, organic matter.....	4.64
Total	99.91

Little Pittsburgh Coal.

At an interval of 20 to 60 feet below the Pittsburgh coal there often occurs another seam of coal, which has been designated the Little Pittsburgh coal.

This coal has been mined at several localities in the Cabell-Wayne-Lincoln area, and a description of these openings follows. The analyses of the samples of coal from these mines will be given in subsequent pages of this volume.

CABELL COUNTY—LITTLE PITTSBURGH COAL.

The Little Pittsburgh coal has been opened in several places in McComas district in Cabell county. **Opening No. 34** is located S 50° E, 4 miles from Barboursville on the waters of Rock fork of Toms creek on the land of Frank Adkins, where the coal is mined for local fuel, and the following section was measured:

Section of Frank Adkins' Coal Opening.

	Ft.	In.
Sandstone		
Slate	2	6
Coal, hard, blocky.....	3	0
Fire clay floor.....	1	0

This has a bright, shining appearance and seems to be a very good fuel coal.

Opening No. 35 is located S 60° E, 3¼ miles from Barboursville on the lands of Thomas Keyser along the waters of Toms creek, where it is mined for domestic fuel use, and the following section was measured :

Section of Thomas Keyser's Coal Opening.

			Ft.	In.
Sandstone and shale roof.....				
Coal, rather hard.....	0'	8"	1	11
Slate	0	1		
Coal, hard.....	1	2		
Fire clay bottom, 645' A. T. Aneroid.				

The coal appears to be very irregular in thickness and to have no great persistency.

Opening No. 36 is located S 45° E, 4½ miles from Barboursville along the waters of Guyandot river, on the lands of John May where the coal was once mined, but the opening is now abandoned.

Opening No. 37 is located S 65° E, 5¼ miles from Barboursville on the land of Catherine Markins, along the waters of Cavil creek, where the coal is opened up, and the following section was measured :

Section of Catherine Markins' Coal Opening.

			Ft.	In.
Sandstone	.....		
Slate	.....		0	6
Coal, laminated	.....1' 3"	}	1	11
Coal and slate	.....0 8			
Gray sandstone floor, 665' A. T. A.				

The coal appears to be impure at this opening and of very little economic value.

WAYNE COUNTY—LITTLE PITTSBURGH COAL.

Opening No. 38 is located S 75° W, 4¼ miles from Salt Rock and ¾ mile east of Winslow along the waters of Glass Lick fork, on the land of W. C. Bias, where the following section was measured :

Section of W. C. Bias' Coal Opening.

	Ft.	In.
Shale roof.....		
Coal and slate.....	2	6
Fire clay floor, 800' A. T.....		

Connellsville Sandstone.

The massive sandstone that occurs from 80 to 100 feet below the Pittsburgh coal in the northern part of the State has been named the **Connellsville sandstone** from Connellsville, Pennsylvania, where the stratum rises out of the bed of the Youghiogheny river. The base of this sandstone, which is frequently double with a shale division, occurs from 125 to 145 feet below the Pittsburgh coal in the Cabell-Wayne-Lincoln area and is quite often massive. It is usually coarse, brownish, and makes an excellent building stone. It is used in northern Lincoln county for foundations and chimneys. The rock splits easily into any desired form or size and while hard to carve, yet it can be readily broken into beautiful forms for rubble masonry.

This sandstone often becomes conglomeratic; especially is this true on the dividing ridge separating the waters of Guyandot river and Twelvepole between Cove Gap and Nestlow, where a bed of pebbles, ranging in size from a small pea to $1\frac{1}{4}$ inches in diameter, occurs at the horizon of this sandstone which is there disintegrated.

In Cabell county the Connellsville sandstone crops along the Ohio river, with a thickness from 20 to 45 feet, very seldom massive, but forming steep bluffs. In the southern part of the county this sandstone is massive and often forms cliffs 40 to 45 feet in height.

In Lincoln county the Connellsville sandstone occurs in the tops of the hills in the northern part of the county, forming steep bluffs and often massive cliffs.

In Wayne county the Connellsville sandstone occurs in the hills throughout the Parkersburg Syncline, its general character being the same as in Cabell and Lincoln.

The Little Clarksburg Coal.

Occurring under the Connellsville sandstone is generally found a slaty fire clay which is a marker of the Little Clarksburg coal, so named from the city of Clarksburg, where it crops along the valleys of Elk, and West Fork. This coal is scarcely ever present in the area described in this volume, but is generally represented by a layer of fire clay, which being impervious to water forms springs of water on the dip side.

The Clarksburg Limestone.

The limestone that often occurs underneath the Little Clarksburg coal occurs at different places in the area discussed in this volume. It is generally a reddish gray limestone, and only 1 to 2 feet thick. It has but little economic value, since it is thin, not at all persistent, and often quite impure.

A sample of this limestone was collected from its crop near Hamlin, Carroll district, Lincoln county, and an analysis made in the laboratory of the West Virginia Geological Survey by J. B. Krak, Assistant Chemist, yields the following results:

Analysis of Clarksburg Limestone.

	Per cent.
Silica (Si O_2).....	5.36
Ferric Iron (Fe_2O_3).....	2.13
Calcium Carbonate (Ca CO_3).....	91.55
Magnesium Carbonate (Mg CO_3).....	1.07
Sulphuric Acid (SO_3).....	0.08
Phosphoric Acid (P_2O_5).....	0.14
Total	100.33

Another sample of the Clarksburg limestone was collected from its crop near Ona, Barboursville district, Cabell county, and an analysis of the same in the Laboratory of the Survey by Mr. J. B. Krak, Assistant Chemist, yields the following results:

Analysis of Clarksburg Limestone from near Ona.

	Per cent.
Silica (Si O_2).....	19.80
Ferrous Carbonate (Fe CO_3).....	12.20
Alumina (Al_2O_3).....	3.93
Calcium Carbonate (Ca CO_3).....	62.10
Magnesium Carbonate (Mg CO_3).....	1.32
Sulphuric Acid (SO_3).....	0.09
Phosphoric Acid (P_2O_5).....	0.11
Loss on ignition, organic matter.....	1.20
Total	100.75

The Morgantown Sandstone.

The sandstone that occurs a few feet below the Clarksburg limestone and separated from it by soft red and sandy shales was named by Dr. John J. Stevenson, the **Morgantown sandstone** from its fine exposures in the vicinity of Morgantown, Monongalia county, where it was once extensively quarried and used in the construction of buildings, among which were those of the State University.

Dr. I. C. White gives an interesting description of this sandstone in Volume II, pages 251-252, West Virginia Geological Survey.

In Cabell county the Morgantown sandstone forms rugged, massive cliffs in the hills along the Ohio, Guyandot and Mud rivers. The bed varies in thickness from 25 to 50 feet and is a bluish gray sandstone weathering to a dirty brown when quarried, and often decomposes when used as a building stone when the surface is exposed. It was used for building bridge piers in the Highway bridge across the Guyandot bridge at Martha.

The Morgantown sandstone forms massive cliffs 40 feet high, south of Milton along Mud river. In Lincoln county the Morgantown sandstone crops in great cliffs along the Hamlin and Huntington Turnpike on the headwaters of Mahone creek, also in the hills along the headwaters of Joes creek, Duval district, and it caps the highest hills south of Griffithsville.

This sandstone is used as a building stone for foundations and chimneys for residences and appears to withstand disin-

tegration forces very well. In Wayne county the Morgantown sandstone crops in the hills along the waters of Big Sandy and Twelvepole.

The bridge abutments across Beech Fork at the mouth of Reuben Branch in Union district are built of this stone.

The Morgantown sandstone caps the highest hills between the waters of Rich and Ferguson creeks in Grant district, Wayne county, and is from 30 to 40 feet thick.

The Elk Lick Coal.

Just under the Morgantown sandstone, or separated from it by only a few feet of sandy shale, there occurs a coal of very wide distribution, which is known as the Elk Lick coal. This coal is of little economic value in the area described for the reason that it is thin and contains too much ash.

In Cabell county the Elk Lick coal crops in the hills in the southern corporate limits of the city of Huntington along the Wayne road where the section shows coal and slate 2' 0". In a small branch near the Colored Orphan Home, Guyandot district, this coal shows the following section:

			Ft.	In.
Slate			1	0
Coal, impure.....	0'	4"	}	10
Coal, hard.....	0	6		
Slate				

William Altizer once opened this coal on Merrick creek, Barboursville district, one mile north of Barboursville where the following section was measured:

	Ft.	In.
Sandstone		
Slate and coal.....	2	0
Slate floor, 585' A. T. A		

The Elk Lick coal crops at Melissa on Davis creek in Barboursville district where it shows coal and slate 1' 2". An opening in this seam was once made on Davis creek about $\frac{1}{4}$ mile north of Melissa, but it is now abandoned and no measurement of the coal could be taken.

It was once opened on C. S. Simmons land on the west side of Guyandot river, one mile and a half west of Barboursville, Barboursville district, where the following measurement was taken:

		Ft.	In.
Sandstone			
Slate		2	0
Coal0' 4"	}	1	2
Slate0 6			
Coal0 4			
Fire clay floor, 620' A. T. A.			

In Lincoln county the Elk Lick coal crops on the head of Joes creek, Duval district, where it shows coal and slate 1' 0".

In **Washington district** the coal crops at several points along the road, showing a thickness of coal and slate from 1 to 2 feet. It also crops along the road on the ridge between Cove Gap and Nestlow at an elevation of 1142 feet, showing the following section:

	Ft.	In.
Slate roof.....		
Coal and slate.....	1	0
Slate floor		

In Wayne county the Elk Lick coal crops at several places and is quite frequently represented by fire clay and black slate.

On the divide between the waters of Twelvepole and Mill creek of Big Sandy river in Lincoln district, this coal crops in the road and shows coal and slate mixed, one foot; elevation, 1000' A. T. A. It also crops at the mouth of Price creek of Beach fork, Union district, where a section shows coal and slate 10"; elevation, 600' A. T. A.

On Whites creek in Butler district, Wayne county, the Elk Lick coal is mined at several places for local fuel use.

Opening No. 39 is located along Bee branch of Whites creek, one mile southeast of Pharoah on the land of G. W. Ely where the coal has been mined for more than 20 years and hauled in wagons for fuel by the farmers. The following section was measured in that mine:

Section of G. W. Ely's Coal Opening.

			Ft.	In.
Shaly sandstone.....			8	0
Slate			1	3
Fire clay.....			0	2
Coal, hard, blocky...1'	0"	}.....	3	4
Slate	1 10			
Coal, laminated.....	0 6			
Coal, bony.....	0 3			
Coal, hard blocky....	0 10			
Fire clay floor, 620' A. T. A.				

The coal has a bright rich appearance and burns freely.

Opening No. 40 is located on the land of Valentine Pyle, Whites creek, 2 miles southeast of Pharoah, Butler district, at an elevation of 670' A. T. and about 100 feet above the creek. The coal has been mined here for local fuel use. Mr. Pyle reports the section of the coal as follows:

Section of Valentine Pyle's Coal Opening.

			Ft.	In.
Slate	.....		
Coal, hard blocky...	1' 0"	}	4	4
Slate	.....1 0			
Coal	.....1 4			
Coal, bony.....	0 2			
Coal	.....0 10			
Fire clay floor.....				

The opening had caved in and the writer was not able to get a sample or section of the coal.

Opening No. 41 is located on Red Oak branch of Whites creek, 2½ miles southeast of Centerville, Butler district, on the lands of J. R. Rutherford, where the following section was measured:

Section of J. R. Rutherford's Coal Opening.

			Ft.	In.
Sandstone, massive.....				
Sandstone, shelly.....			8	0
Slate			0	6
Coal	1'	0"	3	11
Slate	1	0		
Coal, hard.....	1	0		
Coal, laminated...10" to 12				
Fire clay floor, 560' A. T. A				

This coal is hauled from the mines in wagons by the farmers for many miles into the adjacent region for domestic fuel.

Elk Lick Limestone.

From 10 to 45 feet under the Elk Lick coal and 225 to 250 feet below the Pittsburgh bed, there occurs a limestone horizon which has been named the Elk Lick. This limestone is of fresh or brackish water origin and hence does not contain any marine fossils. It is fairly pure and will burn into a good quality of lime for fertilizing purposes. It is fairly persistent throughout the area described in this volume and is seldom less than 10 to 15 inches thick, weathering grayish white where it is exposed to the elements.

In Cabell county its outcrop is confined to the western and southern portion. It dissolves rapidly and thus acts as a fertilizer.

In Lincoln county its crop occurs throughout the northern portion of the county until it reaches the tops of the highest hills south of Spurlockville.

A sample was collected at Salt Rock, Carroll district, where it occurs 20 feet beneath the Morgantown sandstone and is 12 inches thick, from which an analysis made in the Laboratory of the Survey by J. B. Krak, Assistant Chemist, gives the following results:

	Per cent.
Silica (SiO_2).....	2.73
Ferric Iron (Fe_2O_3).....	1.59
Alumina (Al_2O_3).....	1.28
Calcium Carbonate (Ca CO_3).....	91.72
Magnesium Carbonate (Mg CO_3).....	1.84
Sulphuric Acid (SO_3).....	0.14
Phosphoric Acid (P_2O_5).....	0.24
Loss on ignition, organic matter.....	0.45
Total	99.99

This limestone occurs throughout Carroll district and on Big creek it is about 12 inches thick and crops in the hills. A sample was collected there and as analyzed by Mr. Krak, Assistant Chemist, shows the following:

Analysis of Elk Lick Limestone.

	Per cent.
Silica (SiO_2).....	15.57
Ferric Iron (Fe_2O_3).....	8.18
Alumina (Al_2O_3).....	3.86
Calcium Carbonate (Ca CO_3).....	69.68
Magnesium Carbonate (Mg CO_3).....	2.11
Sulphuric Acid (SO_3).....	0.09
Phosphoric Acid (P_2O_5).....	0.66
Total	100.15

The Elk Lick limestone occurs in the hills on the waters of Cobbs creek, east of MacCorkle, where it is about 18 inches thick and dark gray. A sample taken from this locality and analyzed by Mr. Krak gave the following:

Analysis of Elk Lick Limestone.

	Per cent.
Silica (Si O_2).....	14.30
Ferrous Carbonate (Fe_2CO_3).....	2.27
Alumina (Al_2O_3).....	4.99
Calcium Carbonate (Ca CO_3).....	74.80
Magnesium Carbonate (Mg CO_3).....	1.32
Sulphuric Acid (SO_3).....	0.08
Phosphoric Acid (P_2O_5).....	0.25
Loss on ignition, organic matter.....	2.00
Total	100.01

In Wayne county the Elk Lick limestone crops in the hills from the northern part of the county, until it reaches the summits south of Cove creek.

This limestone crops at the mouth of Reuben branch of Beech fork, Ceredo district, where it is from 2 to 3 feet thick, being hard, gray, magnesian and at an elevation of 605' A. T. A.

This limestone also crops in the hills south of Wayne, and can be usually seen where the hill roads cross the measures often in boulders 1 to 2 feet long, beside the road.

This limestone has no economic value except as a fertilizer, since it is not pure enough or thick enough to be used for any other purpose.

The Birmingham Shale.

In the Cabell-Wayne-Lincoln area the Birmingham shales crop throughout the middle portion of the area, and are generally sandy, mixed with some red shales, but they very seldom have the jointed appearance that characterizes them where they were first named, at Birmingham, Pa., now the "Southside," Pittsburgh.

The Grafton Sandstone.

There often occurs at the base of the Birmingham shale, and just over the Ames limestone, a massive sandstone, frequently conglomeratic and pebbly, which is known as the Grafton sandstone, from its occurrence near the town of Grafton, Taylor county. This sandstone is from 10 to 35 feet thick in the Cabell-Wayne-Lincoln area, and is rather coarse grained, and very frequently conglomeratic. It often forms massive cliffs and very much resembles the Morgantown sandstone.

In Cabell county it occurs in the hills in the southern and western part, and forms rough bluffs in the topography.

In Lincoln county this sandstone extends south of the center of the county and caps some of the highest knobs. Manns Knob near the southwestern part of the county is capped with this sandstone.

In Wayne county this sandstone occurs in the hills both north and south of the great Parkersburg Syncline. It gradually rises to the southeast as far as Dunlow, where it caps the highest point. Hookers Knob, a high point 3 miles east of Dunlow is capped by this sandstone.

The Ames or Crinoidal Limestone.

From 275 to 315 feet below the Pittsburgh coal and from 175 to 225 feet above the base of the Conemaugh series, there occurs a persistent, fossiliferous, limestone from 8 to 24 inches thick. This is one of the most interesting formations from a geological standpoint in the entire Appalachian

field. It was named the Ames limestone by Prof. Andrews of the Ohio Geological Survey. It was also called the "Crinoidal" limestone by Dr. J. J. Stevenson. Most of the limestones in the Upper Carboniferous, above the Ames, in the Appalachian area are of fresh or brackish water origin, while the Ames with its overlying limy shales from 20 to 40 feet, which often contains a well marked fossiliferous limestone, designated the Upper Ames, is the last bed found in ascending the Carboniferous column of rocks that contain clearly marked marine fossils.

In the Cabell-Wayne-Lincoln area, the Ames limestone contains marine fossils throughout a portion of northern Cabell and Wayne counties.

At Lavalette, Union district, Wayne county, the shale underlying the Ames limestone is very fossiliferous.

These marine fossils are found at Huntington and extend south towards Kenova and have also been found as far south along Twelvepole creek as Herbert, three miles north of Wayne. These marine fossils are also found as far south along Big Sandy river as Fort Gay. No marine fossils were found along the Guyandot river south of Barbourville, nor were any of these marine fossils found in the Ames limestone or its accompanying beds in the eastern part of the Cabell-Wayne-Lincoln area. *Spirobis* and other fresh or brackish water types were found along the eastern area.

The inference from this condition is that as we pass east from Huntington we approach the mouth of those ancient rivers that transported the thick delta deposits, that filled up the great Appalachian basin and thus the estuarine waters were too fresh to permit the existence of marine life.

In Cabell county the Ames limestone is found in the Chesapeake & Ohio Railroad cut, a short distance west of the station and is finely exposed in the river hills as we advance toward Kenova. The limestone and the overlying shale are both filled with marine fossils. This limestone dips below water level in passing to the south along Guyandot river toward the Parkersburg Syncline, and when it emerges again in the southern part of Cabell, the marine fossils appear to be absent and only fresh water fossils present.

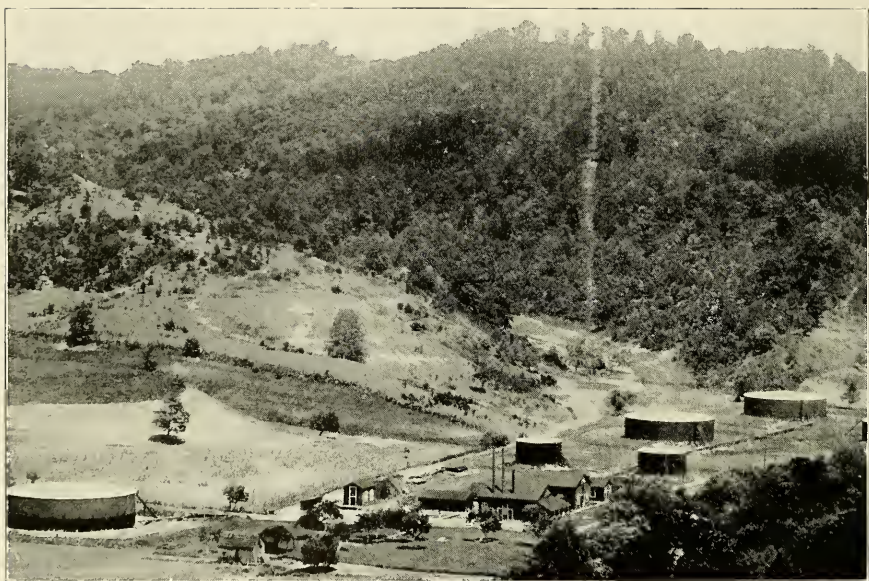


PLATE XIII.—Eureka Pipe Line Pumping Station, Hamlin, Lincoln County.

In Lincoln county the **Ames limestone** horizon crops in the hills in the northern part of the county and contains a limestone from 6 to 18 inches thick, but no marine fossils have been found in the shales or the limestone.

A sample was collected from the Ames horizon in Carroll district, Lincoln county, near Hamlin, where the stratum was 16 inches thick and an analysis made by J. B. Krak, Assistant Chemist, shows the following results:

Analysis of Ames Limestone.

	Per cent.
Silica (Si O_2).....	8.38
Ferric Iron (Fe_2O_3).....	1.78
Alumina (Al_2O_3).....	2.13
Calcium Carbonate (Ca CO_3).....	85.16
Magnesium Carbonate (Mg CO_3).....	1.52
Sulphuric Acid (SO_3).....	0.10
Phosphoric Acid (P_2O_5).....	0.79
Total	99.86

Near Salt Rock in Carroll district the Ames limestone crops and shows a stratum 24 inches thick. A sample was collected here and an analysis made by J. B. Krak, Assistant Chemist, shows the following results:

Analysis of Ames Limestone.

	Per cent.
Silica (Si O_2).....	3.11
Ferrous Carbonate (Fe CO_3).....	1.61
Alumina (Al_2O_3).....	2.03
Calcium Carbonate (Ca CO_3).....	92.60
Magnesium Carbonate (Mg CO_3).....	0.96
Total	100.31

In Wayne county the Ames limestone crops in the hills along Big Sandy river, and wherever found contains marine fossils, as far south as Ft. Gay, being impure and from 8 to 24 inches thick. It is also found in the hills along Twelvepole and occurs in the highest hills as far south as Wayne.

MARINE FOSSILS OF THE CONEMAUGH SERIES.

Dr. J. W. Beede, of the Department of Geology, Indiana University, Bloomington, Ind., has kindly identified the following list of fossils from collections sent him mostly from the horizon of the Ames and Brush Creek Limestones:

Limestones of the Brush Creek horizon, $1\frac{1}{2}$ miles below Cyrus, Ceredo district, Wayne county.

Chonetes granulifer, most abundant species.
Crinoid fragments.
Derbya sp.
Marginifera? sp.
Productus cora.
Serpula? sp.
Strophalosia sp.

These fossils are frequently too fragmentary to permit of accurate determination.

From Lavalette, Union district, from the horizon of the Ames limestone, 320 feet below the Pittsburgh coal.

Astartella gurleyi.
Chonetes granulifer, very abundant.
Crinoid fragments.
Derbya crassa.
Fistulipora? sp.
Myalina? sp.
Ostracod.
Pleurotomaria sp.
Productus cora.
Productus nebraskensis.
Rhombopora lepidodendroidea?
Septopora biserialis.
Serpula? sp.
Trepostira sphaerulata?

From shale overlying Brush Creek coal, Ft. Gay, Wayne county.

Acanthopecten carboniferus.
Aviculopecten, 2 sp.
Aviculopecten?? sp.
Aviculopinna, sp.
Bellerophon percarinatus?
Chonetes granulifer.
Composita argentia?

Deltipecten occidentalis?
Edmondia sp.
Fenestella sp.
Gastropod, 2 sp.
Griffithides scitula.
Loxonema sp.
Nucula parva?
Orbiculoidea sp.
Ostracoda, 6 species.
Parallelodon? sp.
Pelecypod, 2 sp.
Pleurotomaria sp.
Productus Cf. *costatus*.
Productus nebraskensis.
Pteria? sp.
Rhombopora lepidodendroidea?
Schizodus? sp.
Serpula? sp.
Spirifer cameratus.

Collection taken from the side of the county road $\frac{1}{2}$ mile east of Centerville, Wayne county, on Whites creek, on land of W. B. Smith, from the Ames horizon.

Acanthipecten carboniferus.
Aviculopecten hertzeri.
Aviculopecten interlineatus.
Deltipecten occidentalis?
Edmondia sp.
Entolium aviculatum.
Euchondria neglecta.
Fenestella sp.
Griffithides scitula.
Lima krotowi.
Lima retifera.
Nucula ventricosa.
Plant?
Pelecypod sp.
Parallelodon tenuistriata.
Pleurotomaria sp.
Polypora? sp.
Productus Cf. *costatus*.
Productus nebraskensis.
Productus? sp.
Pseudomonotis equistriata?
Pteria? sp.
Spirifer cameratus.
Spirorbis sp.
Strophalosia sp.
Worm remains, Shell borers.

Collection from the Saltsburg sandstone, on the land of H. T. and H. S. Drown, near the mouth of Dry branch of Big Sandy river, $\frac{1}{4}$ mile north of Cedar run and 8 miles south of Kenova.

Bryozoan.
Chonetes granulifer.
Crinoid fragments.
Derbya sp.
Productus nebraskensis.
Rhombopora lepidodendroidea.

About 1500 feet north of Lavalette, Union district, the following section was measured descending in a cut of the Norfolk & Western Railroad:

	Ft.	In.
Sandstone, Grafton.....		
Red shale.....	5	0
Limestone, Upper Ames, fossiliferous.....	2	0
Drab shale, very fossiliferous.....	10	0
Limestone, Lower Ames?.....	2	0
Sandstone		

This limestone is found in the hills in the vicinity of Cove Creek P. O., Stonewall district, but no marine fossils occur in it there.

The Harlem (Crinoidal) Coal.

From 0 to 10 feet beneath the Ames limestone there occurs a coal and fire clay horizon in the Cabell-Wayne-Lincoln area, first named by Dr. Newberry in Ohio as the Harlem coal.

On the divide between the waters of Horse creek and Cobbs creek, Washington district, Lincoln county, the Harlem coal crops in the road at an elevation of 1038' A. T. where it shows a thickness of one foot of coal and slate. Also in Wayne county just east of Hooker Knob the Harlem coal crops in the road just under the Ames limestone and measures 1 foot at an elevation of 1315' A. T. A.

The Pittsburgh Red Shale.

Underneath the Ames limestone and Harlem coal there occurs a series of red and brown shales frequently with lime nuggets scattered through them and sometimes thin layers of sandstone, which from the exposures near Pittsburgh has been named the Pittsburgh red shales. This formation is very persistent, extending entirely across the State, and has been called by the oil well drillers "The Big Red Cave." It crumbles easily and especially when it comes in contact with water, as the red shale it contains is easily disintegrated, and converted into mud.

In Cabell county the Pittsburgh red shale occurs in the hills along the Ohio river at Huntington and east of Huntington, and forms slides along the hillsides. A good grade of red roofing tile is manufactured from these red shales at Huntington. The tiles are hard and great durability is claimed for them by the manufacturer. The State University Library Building at Morgantown is roofed with the Huntington tile.

These shales emerge out of Guyan river south of Barboursville and gradually rise above the stream into the hills. The lime they contain forms good grazing lands and excellent soil for bluegrass.

In Lincoln county the Pittsburgh Red Shale occurs in the hills in the northern and central portion of the county where it makes good grazing land.

In Wayne county the Pittsburgh Red Shale occurs in the northern part of the county from 100 to 200 feet above the level of the valley, but gradually sinks under Twelvepole in the center of the Parkersburg Syncline near Dickson, but gradually emerges to the southward until it escapes from the tops of the hills near Dunlow. These reds form excellent soil for grazing and farming throughout central and southern Wayne county.

The Saltsburg Sandstone.

Occurring below the Pittsburgh Red Shale and often re-

placing it, we frequently find a massive sandstone 20 to 40 feet thick throughout the Cabell-Wayne-Lincoln area which appears to correlate with the Saltsburg sandstone of Stevenson.

In Cabell this Saltsburg sandstone occurs in the northern part of the county west of Huntington and in McComas district in the southern part. It varies in thickness from 10 to 20 feet and is hard and massive.

In Lincoln this sandstone occurs throughout the northern and middle portion of the county. It forms rugged cliffs along Coal river in Washington district and caps the hills just east of the forks of Coal river. It ranges in thickness from 15 to 30 feet, and is hard, coarse grained, and frequently pitted and hollowed by wind erosion.

In Wayne the Saltsburg sandstone crops in the hills along Big Sandy river as far south as Ft. Gay where it caps the highest hills. Along Twelvepole this sandstone rises out of the Parkersburg Syncline south of Dickson and gradually gets higher above that stream to the south until it passes into the air near the southern end of the county. Its thickness varies from 20 to 50 feet in the southern part where it is most massive. In western Wayne between Neal and the mouth of Whites creek, the top portion of this sandstone contains marine fossils.

The Bakerstown (Barton) Coal.

A few feet below the Saltsburg sandstone and from 60 to 90 feet below the Ames limestone occurs the Bakerstown coal, so called from a town of that name in Allegheny county, Penna., where this coal was once mined.

In the Cabell-Wayne-Lincoln area this coal is very thin and of little economic or commercial value. It has been opened in several places, and coal mined for local fuel, but it is generally slaty and high in ash.

No openings were found in the Bakerstown coal in Cabell county, although at localities in the southern part of the county coal blossoms were noted at this horizon.

In Lincoln county this coal crops at many points and has been mined. It was once operated for local use in Sheridan district along the C. & O. Railway, north of West Hamlin, by Jackson Perry. There Dr. I. C. White once measured the following section at the Perry opening:

	Ft.	In.
Sandstone, massive, Saltsburg.....	30	0
Concealed	15	0
Coaly clay and shale.....	2	0
Shale, drab.....	3	0
Shale, dark.....	0	6
Coal, Bakerstown, good.....	2	0
Concealed to C. & O. R. R. grade.....	40	0

On the head of McClarity branch, Laurel Hill district, the Bakerstown coal was found exposed, where the following section was measured descending:

	Thickness Feet.	Total Feet.
Limestone, dark gray, (Ames).....	2	2
Red and sandy shales, (Pittsburgh Reds)	28	30
Sandstone, coarse grained, (Saltsburg)...	45	75
Coal and slate, (Bakerstown).....	4	79
Elevation, 955' A. T. A.		

About 3 miles south of Ceredo Station on the Norfolk & Western Railroad along Twelvepole, Ceredo district, the same fossiliferous limy sandstone horizon exposed near Cyrus crops in a railway cutting as follows:

	Thickness Feet.	Total Feet.
Sandstone, massive, Saltsburg.....		
Sandy shales	16	16
Limy sandstone	4	20
Sandy shales.....	10	30
Limestone, dark fossiliferous.....	0'6"	30'6"
Dark shales	9'6"	40
Coal and slate, Bakerstown.....	2	42
Concealed	10	52
Sandstone, massive, Buffalo, to bed of Twelve-pole creek	12	64

Dr. I. C. White once measured this section (See Vol. II, W. Va. Geol. Survey, page 279), but he supposed then that this coal was the Brush creek instead of the Bakerstown.

The preceding measurements are typical sections of the Bakerstown coal and show that throughout Wayne county this bed is thin and can hardly be classed among the important coals of the future. It has now and will continue to have some local importance.

Pine Creek Limestone.

There often occurs a limestone from 10 to 30 feet beneath the Bakerstown coal that has been called the **Pine Creek limestone** by Dr. I. C. White. It is a bluish gray limestone and sometimes very fossiliferous, containing marine fossils, at several localities within the Cabell-Wayne-Lincoln district.

Buffalo Sandstone.

From 15 to 30 feet under the Bakerstown coal there occurs a coarse grayish white, pebbly, and often massive sandstone varying in thickness from 25 to 60 feet, which appears to correlate with the Buffalo sandstone of Dr. I. C. White. This sandstone is a very persistent bed and extends from the northern part of the State southwestward through its entire length.

In the Cabell-Wayne-Lincoln area this sandstone forms bold cliffs along Big and Little Coal, Mud, Guyandot, Twelvepole, and Big Sandy rivers.

In Cabell county the Buffalo sandstone rises above the bed of the Guyandot, north of Salt Rock, and forms massive cliffs along the river hills. In McComas district, near Johnson, along the waters of Raccoon creek, this sandstone forms cliffs in the hills and gradually goes under the bed of the stream just south of Winslow.

In Lincoln county the Buffalo sandstone makes bold cliffs along the waters of Mud river and its tributaries. This rock is a good building stone and is frequently used by the farmers for erecting foundations and chimneys. It was quarried one mile east of Griffithsville and used in the construction of the Griffithsville Bank.

Along the waters of the Guyandot river and its tributaries it forms cliffs and gradually rises to the south until it caps the hills near the southern boundary. In Wayne county the Buffalo sandstone crops in the northern part of the county and forms cliffs along the top of the Ohio river hills. It crops in the hills along the Big Sandy river and its tributaries as far south as Fort Gay where it caps the highest hills. It also occurs in the hills on the divide between the waters of Twelvepole and Big Sandy to the southern boundary of Wayne county.

Brush Creek Limestone.

From 5 to 10 feet under the Buffalo sandstone there frequently occurs a dark fossiliferous limestone over some black shale in the roof of a coal seam. This limestone was called the **Brush Creek** by Dr. I. C. White from a stream by that name in Butler county, Penna. In the Cabell-Wayne-Lincoln area its horizon is 75 to 100 feet above the Upper Freeport coal.

The Brush Creek Coal.

The Brush Creek coal occurs a few feet beneath the limestone from which it is separated by two to five feet of fossiliferous shales. The horizon of this coal is from 50 to 75 feet above the Upper Freeport bed. It is exposed at several points along Big Sandy river in the railroad cuttings. This coal is mined for local fuel use along the Norfolk & Western Railroad from Cyrus as far south as Fort Gay, where it occurs high up in the hills, as shown in the section taken at that place and given on page 76.

In Cabell county the Brush Creek coal comes to the surface only near the southern boundary line along the Guyandot river.

In Lincoln county the Brush Creek coal crops out along Island creek, Washington district, where the following section was taken on land of W. H. Crawford about two miles above the mouth of Island creek:

	Thickness Feet.	Total Feet.
Sandstone .....15' } Buffalo	35	35
Sandy shale.....20 }		
Limestone, dark gray above, gray below (Brush Creek).....	5	40
Black shale and concealed.....	15	55
Coal and slate, (Brush Creek), 730' A. T.	3	58

The **Brush Creek** coal is here impure and slaty. No marine fossils were seen in the overlying limestone.

Near the head of **Island creek** in **Washington district**, the following section was measured:

Island Creek Section, Washington District.

	Thickness Feet.	Total Feet.
Sandstone, flaggy, (Saltsburg).....	45	45
Fire clay, dark blue, (Bakerstown coal horizon)	1	46
Limestone, hard, blue, (Pine Creek).....	5	51
Sandstone, massive, (Buffalo).....	24	75
Limestone, impure, (Brush Creek).....	2	77
Concealed	10	87
Fire clay and slate (Brush Creek coal)..	3	90

In **Wayne county** the **Brush Creek** coal is mined for local fuel use on the waters of **Big Sandy river** and its tributaries from a point near **Cyrus** to **Ft. Gay**.

On **Big Hurricane creek**, two miles east of **Hubbardstown**, **Butler district**, the following section was measured:

Big Hurricane Section, Butler District.

	Thickness Feet.	Total Feet.
Sandstone, coarse, conglomeratic, Buffalo	48	48
Sandy shale.....	2	50
Limestone, dark, fossiliferous.....	4	54
Dark slate.....	2	56
Coal and slate (Brush Creek).....	4	60
Fire clay.....	2	62
Sandstone, Mahoning , 10 feet visible.		

The limestone is dark and fossiliferous, containing marine fossils.

The Brush Creek coal has been opened on the lands of Mrs. Mary Parks on Hurricane creek, and mined for local fuel use one-half mile east of Hubbardstown, Butler district, where the following section was measured:

Mrs. Mary Parks' Coal Opening, Butler District.

	Thickness Feet.	Total Feet.
Slate roof.....		
Coal and slate.....1' 6"	4' 1"	4' 1"
Coal, hard.....1 0		
Slate .....0 10		
Coal .....0 9		
Fire clay floor.....		

This seam is often called the "Forked Seam."

Mahoning Sandstone.

From 10 to 30 feet below the Brush Creek coal a very massive sandstone makes its appearance, and it correlates with the Mahoning sandstone. This stratum is from 40 to 60 feet thick in the Cabell-Wayne-Lincoln area. It caps the hills in the southern part of the area described and extends east into Fayette, Boone, Raleigh, Logan and Mingo counties. It is very hard and pebbly on the tops of these eastern summits and often occurs more than 1500 feet above the level of the valley floors. It splits readily into blocks of any desirable size and is much used for building stone. In Cabell county the Mahoning sandstone rises above the surface along the Guyandot river at Salt Rock and is 40 to 45 feet thick, and massive.

In Lincoln county the Mahoning sandstone crops along Mud river and its tributaries and forms massive cliffs which gradually rise to the tops of the hills in the southern part of the county. It is quarried at several points by farmers for foundations and chimneys, appearing to withstand the weather fairly well and disintegrates slowly. It often weathers into wierd shapes, due possibly to the presence of pyrites and wind erosion.

In Wayne county, the Mahoning sandstone forms mas-

sive cliffs just south of Kenova and also along Big Sandy river and its tributaries as far south as the southern boundary of the county, where it caps the highest hills after it rises out of the Parkersburg Syncline.

Along Twelvepole the Mahoning sandstone comes out the creek between Herbert and Wayne and forms massive cliffs just south of the Norfolk & Western Railroad station at Wayne, and along the hills, rising gradually above the floor of the valley to the southern boundary of the county, where it caps the summits.

CHAPTER VII.

THE ALLEGHENY SERIES.

The thickness of the Allegheny series extending from the Upper Freeport coal to the Homewood sandstone varies in different parts of the State from 250 feet in the northern part to less than 150 feet in the southwestern portion.

A few sections in addition to those already mentioned will now be given to show the rock succession of the Allegheny series in the three counties under discussion.

The following section was measured descending the hill into Camp creek from the west and joined onto a core drill hole (W-36) on the property of the East Lynn Coal Company, on Little Lynn creek, $\frac{1}{2}$ mile east of East Lynn, Wayne county:

East Lynn Section, Stonewall District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (230')			
Sandy shale and concealed.....	30	30	
Red limy shale.....	15	45	
Sandstone, flaggy, Grafton	15	60	
Red limy shale.....	40	100	
Sandstone, flaggy, micaceous, Saltsburg	44	144	
Sandy shale.....	11	155	
Sandstone and sandy shale, (Buffalo)....	40	195	
Coal and slate, Brush Creek	3	198	
Sandy shale and sandstone.....	32	230	230'
Allegheny Series (121')			
Fire clay, Upper Freeport coal horizon ..	2	232	
Sandy shale and sandstone.....	28	260	
Fire clay and coal blossoms, Lower Freeport	3	263	
Sandstone, massive, Freeport	83	346	
Coal, (No. 5 Block), 695' A. T.	5	351	121'
Kanawha Series (275' 9")			
Sandstone to top of boring, (Homewood)	29	380	
Surface	38	418	
Rock and coal mixed.....	5	423	
Sand rock	9	432	

	Thickness Feet.	Total Feet.
Rock and coal mixed.....	8	440
Sand rock.....	4 6"	444 6"
Dark rock.....	1 6"	446
Sand rock.....	36 5"	482 5"
Coal	0 1"	482 6"
Sand rock.....	0 2"	482 8"
Sandy slate.....	16 0"	498 8"
Sand rock.....	5 0"	503 8"
Sandy slate.....	0 6"	504 2"
Sand rock.....	7 0"	511 2"
Slate	10 4"	521 6"
Impure coal.....0' 2½"	Coalburg or Stockton- Lewiston.	7 6"
Good coal.....1 8½"		
Parting .....1 0		
Impure coal.....0 3½"		
Good coal.....1 7		
Impure coal.....0 4½"		
Good coal.....0 4		
Impure coal.....0 6½"		
Good coal.....1 6		
Fire clay.....	7 3"	536 3"
Coal	0 2"	536 5"
Black slate.....	0 6"	536 11"
Sandy fire clay.....	3 4"	540 3"
Streaked sand rock.....	4 0"	544 3"
Dark slate.....	3 0"	547 3"
Streaked rock.....	5 0"	552 3"
Sandy fire clay.....	5 6"	557 9"
Streaked rock.....	45 0"	602 9"
Coal mixed with rock.....	1 0"	603 9"
Sand rock.....	12 6"	616 3"
Rock mixed with coal.3' 0"	Winifrede horizon	8 0"
Sandy slate.....3 2		
Black slate.....1 2		
Coal .....0 8		
Sandy fire clay to bottom.....	2 6"	626 9" 275' 9"

The above section shows the Allegheny series to have a thickness of only 121 feet.

The following section was measured descending into Brushy fork of Peter Cave fork of Horse creek, Duval district, Lincoln county:

Brushy Fork Section, Duval District.

Conemaugh Series (220')	Thickness Feet.	Total Feet.
Sandstone, Grafton.....	65	65
Sandy shale.....	15	80
Limy shale.....	5	85
Sandy shale.....	30	115
Red shale.....	5	120

	Thickness Feet.	Total Feet.	
Sandstone, friable, coarse, Buffalo	60	180	
Fire clay and coal blossom, Brush Creek	3	183	
Sandstone, ferruginous, Mahoning	37	220	220'
Allegheny Series (129')			
Fire clay and coal, Upper Freeport	3	223	
Sandstone	20	243	
Coal blossom, Lower Freeport	2	245	
Sandstone, Freeport	50	295	
Coal, hard.....	2	297	
Sandstone	50	347	
Coal, No. 5 Block	2	349	129'
Kanawha Series (133')			
Sandstone, hard, Homewood	50	399	
Coal	4'	} Lewiston	413
Slate	8		
Coal	4		
Slate	3	416	
Sandstone, hard, irregular.....	50	466	
Cannel coal and slate, Winifrede	2	468	
Fire clay.....	3	471	
Sandstone to 722' A. T. L.....	11	482	133'

This section shows the presence of four different coal seams in the Allegheny series.

The following section was measured at Julian, Boone county, about 1 mile south of the Lincoln-Boone county line:

Julian Section, Scott District, Boone County.

	Thickness Feet.	Total Feet.	
Conemaugh Series (132')			
Concealed	100	100	
Coal and slate, Brush Creek	3	103	
Sandstone and sandy shale, Mahoning ...	29	132	132'
Allegheny Series (138')			
Coal	0' 10"	} (Upper Freeport)	137
Bone	1		
Coal, hard.....	1		
Slate	0		
Coal	1		
Slate	0		
Coal	1		
Slate	0		
Coal (visible).....	8	}	172
Sandstone and concealed.....	35		
Coal blossom, Lower Freeport	3		
Sandstone, massive, Freeport	72		
Fire clay, (No. 5 Block).....	1		
Sandstone, massive and concealed.....	21	269	
Fire clay.....	1	270	138'

	Thickness Feet.	Total Feet.	
Kanawha Series (132')			
Sandstone, massive, Homewood	25	295	
Sandy shale.....	4	299	
Sandstone and concealed.....	33	332	
Coal and slate.....3' }			
Shale and fire clay.....5' }			
Coal blossom.....3' }			
Sandstone, sandy shale and concealed...	47	390	
Coal, cannel , Coalburg	2	392	
Sandstone to creek at 645' A. T. L.....	10	402	132'

The following section was measured with aneroid descending the hill from the east into Mill creek about one mile above its forks, Butler district, Wayne county:

Mill Creek Section, Butler District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (278')			
Sandstone, friable, coarse.....	5	5	
Limy shale.....	5	10	
Sandstone, shale and concealed.....	29	39	
Limestone, hard, yellowish, (Elk Lick)..	4	43	
Limy and sandy shale.....	27	70	
Limestone, brecciated, hard, ferruginous, variegated	3	73	
Fire clay, dark.....	5	78	
Sandstone, flaggy, (Grafton).....	17	95	
Red, limy and sandy shale.....	18	113	
Limy shale.....	9	122	
Coal blossom, Harlem?	1	123	
Limy and red shale.....	10	133	
Fire clay.....	2	135	
Sandstone, massive, coarse, (Saltsburg)..	44	179	
Fire clay.....	1	180	
Sandstone and concealed.....	26	206	
Fire clay, (Bakerstown coal?).....	2	208	
Sandy shale and concealed.....	25	233	
Fire clay.....	2	235	
Sandstone and concealed.....	27	262	
Coal and slate.....	1	263	
Sandstone and sandy shale.....	15	278	278'
Allegheny Series (157')			
Coal and slate, (Upper Freeport).....	2	280	
Sandstone	28	308	
Fire clay, Lower Freeport	2	310	
Sandstone, massive, coarse, Freeport	55	365	
Sandy shale and sandstone.....	38	403	
Fire clay.....	2	405	
Sandstone, massive.....	25	430	
Coal and slate, No. 5 Block.....	5	435	157'

The following section was measured descending a hill near the head of Sweetwater branch on West fork of Twelvepole, north of Doane, Lincoln district, Wayne county:

Doane Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (155')			
Sandstone and concealed.....	53	53	
Fire clay.....	2	55	
Sandstone, flaggy.....	30	85	
Sandstone and concealed to bench.....	40	125	
Sandstone and concealed.....	30	155	155'
Allegheny Series (150')			
Fire clay, (Upper Freeport).....	2	157	
Sandstone, massive, medium coarse grained, (Lower Freeport).....	45	202	
Fire clay.....	3	205	
Sandstone, massive, friable.....	98	303	
Coal and slate, No. 5 Block.....	2	305	150'
Kanawha Series (155')			
Sandstone, massive, coarse, Homewood..	105	410	
Shale, (Lewiston coal horizon).....	5	415	
Sandstone, massive, coarse.....	45	460	155'

The following section was measured with aneroid descending from top of Porter Knob into head of Blue Lick branch, Grant district, Wayne county, two miles south of Kiahville:

Porter Knob Section, Grant District.

	Thickness Feet.	Total Feet.
Conemaugh Series (367')		
Sandstone, massive, coarse, (Morgan- town)	31	31
Bench and sandy shale.....	5	36
Sandstone and concealed.....	28	64
Coal and slate.....	1	65
Sandstone and concealed.....	22	87
Red, limy and sandy shale.....	28	115
Sandstone, friable, massive, coarse (Grafton)	35	150
Fire clay and sandy shale.....	5	155
Sandstone and concealed, (Saltsburg)...	60	215
Fire clay.....	2	217
Red and sandy shale.....	38	255
Fire clay.....	2	257
Sandstone and concealed, (Buffalo).....	33	290
Red limy shale.....	5	295

	Thickness Feet.	Total. Feet.	
Fire clay, dark (Brush Creek coal).....	4	299	
Sandstone	31' }	68	367'
Sandstone, broken.....	37 }		
Allegheny and Kanawha Series (288')			
Coal and slate, Upper Freeport.....	3	370	
Sandstone, massive and concealed.....	105	475	
Coal and slate and fire clay (No. 5).....	5	480	
Sandstone and concealed.....	105	585	
Coal, Stockton-Lewiston.....	5	590	
Sandstone and concealed.....	40	630	
Coal	2	632	
Sandstone, massive, to 738' A. T. L.....	23	655	288'

The following section was measured with aneroid descending the hill from the west into Jackson branch of West fork of Twelvepole, Lincoln district, Wayne county:

Jackson Branch Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (242')			
Sandy shale, sandstone and concealed...	50	50	
Limy red shales.....	5	55	
Sandy shale and sandstone	15' }		
Limy shale.....	5 }	48	103
Sandstone, massive, coarse	28 }		
Fire clay, (Bakerstown coal).....	2	105	
Sandstone, massive, coarse, (Buffalo)....	35	140	
Sandy shale and concealed.....	48	188	
Fire clay, (Brush Creek coal).....	2	190	
Sandstone and concealed.....	52	242	242'
Allegheny Series (123')			
Fire clay, (Upper Freeport coal).....	3	245	
Sandstone, (Mahoning).....	58	303	
Fire clay.....	2	305	
Sandstone	30	335	
Slate, bituminous...0' 3" }			
Coal, blocky.....0 7 }			
Coal, bony.....0 2 }			
Coal, blocky.....0 5 }			
Slate	0 4 }		
Coal, gas.....0 9 }			
Fire clay (vis).....	2 6"	340	
Sandstone to 740' A. T. L.....	25	365	123'

The following section was measured with aneroid descending hill along the road to Kiah creek, one-half mile north of Queen Ridge P. O., Grant district, Wayne county:

Queen Ridge Section, Grant District.

	Thickness	Total	
	Feet.	Feet.	
Conemaugh Series (202')			
Sandstone and concealed, (Saltsburg)...	25	25	
Limy and red shale.....	15	40	
Sandy shale.....	5	45	
Limy red shale.....	10	55	
Sandy shale.....	13	68	
Limy shale and fire clay, (Bakerstown)..	2	70	
Sandy shale.....	5	75	
Red limy shale.....	3	78	
Fire clay....	2	80	
Sandstone, massive, gray, (Buffalo)....	85	165	
Sandy shale.....	5	170	
Fire clay, dark.....	5	175	
Sandstone, massive, (Mahoning).....	27	202	202'
Allegheny Series (208')			
Fire clay and coal blossom, (Upper Freeport) .....	.3	205	
Sandstone, medium grained.....	30	235	
Sandy shale and fire clay.....	5	240	
Sandstone, massive, coarse.....	45	285	
Sandy shale.....	20	305	
Sandstone, massive, coarse, gray.....50'	} East Lynn	104	409
Sandstone, flaggy.....25			
Sandstone, massive.....29			
Fire clay, (No. 5 Block).....	1	410	208'
Kanawha Series (150')			
Sandstone, massive, coarse	} Homewood	49	459
Sandstone, flaggy.....23			
Coal blossom, (Stockton-Lewiston).....	1	460	
Sandstone, massive and flaggy.....	75	535	
Coal, blossom, (Coalburg).....	2	537	
Sandstone, massive, to bed of creek, at 705' A. T. L.....	23	560	150'

The following section was measured with aneroid descending a hill along the road to East fork of Twelvepole at Eloise, Grant district, Wayne county:

Eloise Section, Grant District.

	Thickness	Total	
	Feet.	Feet.	
Conemaugh Series (245')			
Sandstone	40	40	
Red shale	2	42	
Sandstone	} (Saltsburg?)	50	92
Sandstone			
Red limy shale.....	8	100	
Sandstone, friable, Buffalo.....	60	160	
Fire clay and slate (Brush Creek).....	5	165	
Sandstone, (Mahoning).....	80	245	245'

	Thickness Feet.	Total. Feet.	
Allegheny Series (132')			
Fire clay, (Upper Freeport coal horizon)	3	248	
Sandstone	60	308	
Fire clay.....	5	313	
Sandstone, massive.....	62	375	
Fire clay, (No. 5 Block).....	2	377	132
Kanawha Series (191')			
Sandstone, Homewood.....	86	463	
Slate and fire clay.....	2	465	
Sandstone, ferruginous.....	27	492	
Sandy shale and concealed.....	3	495	
Sandstone, massive, current bedded to Twelve-pole, at 722' A. T. A.....	73	568	191'

The following section was measured with aneroid, descending into Right fork of Rich creek from the south, Grant district, Wayne county:

Rich Creek Section, Grant District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (260')			
Red limy shale, concealed and sandstone	40	40	
Coal, Harlem	2	42	
Sandstone and sandy shale.....	38	80	
Coal, Bakerstown.....	2	82	
Red and sandy shale.....	3	85	
Sandstone	22	107	
Fire clay and limy shale.....	5	112	
Red and limy shale.....	23	135	
Sandy shale.....	10	145	
Sandstone and sandy shale, Buffalo.....	50	195	
Sandstone, massive, buff, Mahoning.....	65	260	260'
Allegheny Series (122')			
Sandy shale.....	5	265	
Sandstone and concealed.....	40	305	
Sandy shale.....	5	310	
Sandstone to bench.....	70	380	
Coal and slate, (No. 5 Block).....	2	382	122'
Kanawha Series (95')			
Sandstone and concealed, (Homewood) ..	93	475	
Coal, Stockton-Lewiston, to 840' A. T. A.	2	477	95'

The following section was measured with aneroid descending hill along the road into Beechy branch of East fork of Twelvepole, Grant district, Wayne county:

Beechy Branch Section, Grant District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (225')			
Sandstone	15	15	
Fire clay, dark.....	5	20	
Limy red shales.....	35	55	
Sandy shale	10	65	
Sandstone, massive, friable, (Saltsburg)	55	120	
Coal blossom and fire clay, (Bakerstown)	5	125	
Sandy shale, sandstone and concealed, (Buffalo and Mahoning Sandstone)....	100	225	225'
Allegheny Series (153')			
Fire clay, (Upper Freeport coal horizon).	5	230	
Sandstone, massive, coarse.....	50	280	
Fire clay and coal.....	2	282	
Sandstone, massive.....	48	330	
Fire clay and concealed.....	5	335	
Sandstone	35	370	
Coal, laminated.....1' 0" }			
Fire clay.....0 3 }			
Coal, block.....1 4 }	No. 5 Block.	4' 1"	374' 1"
Coal, bony.....1 6 }			
Fire clay.....	0' 7"	374' 8"	
Concealed	3' 4"	378	153'
Kanawha Series (88')			
Sandstone, massive, (Homewood).....	77	455	
Coal and slate mixed...4' 0" }			
Slate .....1 3 }			
Coal, impure.....1 0 }			
Fire clay.....0 7 }	(Lewiston)	10' 3"	465' 3"
Coal, laminated.....1 2 }			
Slate and coal mixed...0 7 }			
Coal, block.....1 0 }			
Coal, bony.....0 8 }			
Fire clay to 850' A. T. A.....	0' 9"	466	88'

The following section was measured with aneroid descending a hill along the road into Ferguson from the north, Lincoln district, Wayne county:

Ferguson Section, Lincoln District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (122')			
Sandstone, massive, conglomeratic, Buf- falo	55	55	
Limy red shale.....	5	60	
Sandstone and sandy shale, (Mahoning)	62	122	122'

	Thickness Feet.	Total. Feet.	
Allegheny Series (125')			
Coal blossom, (Upper Freeport).....	3	125	
Sandy shale.....	15	140	
Fire clay and coal blossom (Lower Free- port)	2	142	
Soft shale.....	25	167	
Fire clay and dark shale.....	3	170	
Sandstone, massive, coarse, (East Lynn)	75	245	
Fire clay, (No. 5 Block coal horizon)....	2	247	125'
Kanawha Series (178')			
Sandstone, coarse, massive, (Homewood)	86	333	
Coal blossom.....2' } Stockton-			
Sandstone .....3' } Lewiston.	10	343	
Coal blossom.....5' }			
Sandstone, flaggy.....	80	423	
Coal blossom, (Coalburg), to 700' A. T. B	2	425	178'

The following section was measured with aneroid descending a hill just north of Ranger, Laurel Hill district, Lincoln county:

Ranger Section, Laurel Hill District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (85')			
Sandy shale and concealed.....	13	13	
Fire clay.....	2	15	
Red limy shale.....	5	20	
Sandstone, massive, coarse, Buffalo.....	27	47	
Fire clay and coal blossom, Brush Creek	3	50	
Sandstone, massive, coarse, Mahoning..	35	85	85'
Allegheny Series (125')			
Fire clay, (Upper Freeport coal horizon)	3	88	
Sandstone, massive, very friable.....	105	193	
Sandy shale.....	17	210	125'
Kanawha Series (295')			
Sandstone, micaceous, friable, (Homewood)	70	280	
Sandy shale.....	10	290	
Sandstone, massive, coarse, (Coalburg) ..	75	365	
Sandy shale.....	10	375	
Sandstone and concealed.....	30	405	
Sandy shale.....	5	410	
Sandstone and concealed.....	35	445	
Sandy shale.....	8	453	
Fire clay, dark.....	2	455	
Sandstone, massive, coarse.....	25	480	
Sandy shale and concealed to 595' A. T. B	25	505	295'

The following section was measured with aneroid descending a hill from the east to Pound fork, 3 miles west of Midkiff, Laurel Hill district, Lincoln county:

Pound Fork Section, Laurel Hill District.

	Thickness	Total.	
	Feet.	Feet.	
Conemaugh Series (215')			
Sandstone	10	10	
Limy, red and sandy shales.....	35	45	
Sandstone, sandy shale and concealed...	20	65	
Red shale.....	10	75	
Sandy shale, sandstone and concealed...	55	130	
Sandstone, flaggy, (Buffalo).....	35	165	
Sandy shale	10	175	
Sandstone, massive, (Mahoning).....	40	215	215'
Allegheny Series (225')			
Sandy shale and sandstone.....	125	340	
Sandy shale and sandstone to bench....	65	405	
Sandstone	33	438	
Coal blossom, (No. 5 Block coal).....	2	440	225'
Kanawha Series (85')			
Sandstone, massive,	} Homewood 82	522	
coarse .....40'			
Sandy shale..... 5			
Sandstone .....37	} A. T. B. 3	525	85'
Coal, Stockton-Lewiston, to 630'			

The Allegheny series appears to be 225 feet thick, but it is possible that the Conemaugh series should be extended farther down in the column than shown in the section.

The following section was measured with aneroid descending a hill into the Right Hand fork of Little Lynn creek, Stonewall district, Wayne county, 3 miles northeast of East Lynn:

Little Lynn Section, Stonewall District.

	Thickness	Total.
	Feet.	Feet.
Conemaugh Series (240')		
Sandy shale.....	5	5
Sandstone, massive.....	25	30
Red shale.....	2	32
Sandstone and sandy shale.....	13	45
Red limy shale.....	10	55
Sandstone, massive, friable, coarse, (Saltsburg)	45	100
Red limy shale.....	5	105
Sandy shale.....	15	120
Red limy shale.....	5	125
Limestone, dark, hard.....	2	127
Red limy shale.....	18	145
Sandstone, massive.....17'	} Buffalo... 42	187
Sandy shale and sandstone .....25		
Limy shale.....	13	200
Sandstone, (Mahoning).....	40	240

	Thickness Feet.	Total. Feet.
Allegheny Series (113')		
Fire clay, (Upper Freeport coal horizon)	2	242
Sandstone, massive, ferruginous.....	38	280
Sandstone	70	350
Coal, (No. 5 Block).....	3	353

The following section was measured with aneroid descending a hill to Right fork of Ten Mile creek, about $\frac{1}{2}$ mile north of Cuzzie, Laurel Hill district, Lincoln county:

Cuzzie Section, Laurel Hill District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (103')			
Sandy and limy shale.....	40	40	
Light limy shale.....	15	55	
Sandy shale.....	10	65	
Sandstone, coarse, massive, very friable (Mahoning)	38	103	103'
Allegheny Series (137')			
Fire clay and limy shale.....	2	105	
Sandstone with iron nodules.....	32	137	
Fire clay.....	3	140	
Sandstone, massive, coarse.....	50	190	
Sandy shale and fire clay (Lower Free- port)	10	200	
Sandstone, ferruginous.....	35	235	
Sandy shale.....	5	240	137'
Kanawha Series (150')			
Sandstone, massive, coarse, (Homewood)	45	285	
Sandy shale.....	5	290	
Sandstone	50	340	
Sandy shale.....	10	350	
Sandstone, massive, coarse.....	40	390	150'

The following section was measured with aneroid descending a hill from the east to the head of Licklog branch, 1 mile east of Quaker P. O., Lincoln district, Wayne county:

Quaker Section, Lincoln District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (140')			
Sandstone and concealed, Buffalo.....	85	85	
Fire clay, (Brush Creek coal horizon)....	1	86	
Sandstone, massive, coarse, Mahoning...	54	140	140'
Allegheny Series (201')			
Fire clay, (Upper Freeport coal horizon)	2	142	
Sandstone and concealed.....	63	205	
Fire clay.....	2	207	

	Thickness Feet.	Total. Feet.	
Sandstone, massive, coarse.....	108	315	
Sandy shale.....	5	320	
Coal blossom, (No. 5 Block).....	1	321	
Sandy shale.....	19	340	
Coal blossom, (Clarion).....	1	341	
Kanawha Series (154')			
Sandstone and concealed, Homewood....	54	395	
Coal blossom, (Stockton-Lewiston).....	2	397	
Sandstone, massive, Coalburg.....	53	450	
Coal and slate, Coalburg.....	2	452	
Sandstone and concealed, (Winifrede)..	40	492	
Coal and slate, Winifrede, to 725' A. T. B.	3	495	154'

The following section was measured descending a hill from the west into Lick creek, $3\frac{1}{2}$ miles northeast of Kiahville, Stonewall district, Wayne county:

Lick Creek Section, Stonewall District.

	Thickness Feet.	Total. Feet.	
Conemaugh Series (125')			
Sandy shale, sandstone and concealed, (Buffalo)	30	30	
Red and sandy shale.....	40	70	
Sandstone, massive, coarse, (Mahoning). ..	55	125	125'
Allegheny Series (185')			
Sandy shale.....	5	130	
Sandstone, massive, Freeport.....	130	260	
Sandy shale.....	10	270	
Sandstone, massive, ferruginous.....	35	305	
Coal and slate, No. 5 Block.....	5	310	185'
Kanawha Series (152')			
Sandstone, massive, medium coarse grained, Homewood.....	50	360	
Fire clay, Stockton-Lewiston.....	3	363	
Sandy shale.....	7	370	
Sandstone, massive, coarse, (Coalburg)..	50	420	
Sandy shale.....	10	430	
Sandstone	30	460	
Coal, Winifrede, to 700' A. T. B.....	2	462	152'

The following section was measured with aneroid descending a hill from the south into Joels branch, Butler district, Wayne county:

Joels Branch Section, Butler District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (113')			
Reddish limestone.....	2	2	
Sandstone, conglomeratic, Buffalo	56	58	
Red and sandy shale.....	10	68	
Fire clay.....	2	70	
Sandstone, Mahoning	43	113	113'
Allegheny Series (187')			
Coal and slate, (Upper Freeport).....	2	115	
Sandstone	13	128	
Fire clay.....	2	130	
Sandstone	39	169	
Coal and slate, (Lower Freeport).....	1	170	
Sandstone	58	228	
Slate	2	230	
Sandstone and concealed.....	64	294	
Slate	3	297	
Coal and slate, (No. 5 Block).....	3	300	187'
Sandstone, (Homewood), to 620' A. T. B.	30	330	

The following section was measured descending a hill from the west $\frac{1}{2}$ mile north of Fleming, Lincoln district, Wayne county:

Fleming Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (293')			
Red limy shale and sandy shale.....	50	50	
Sandstone, massive, coarse, conglomeratic	50	100	
Fire clay and slate.....	3	103	
Limestone, yellowish, impure.....	2	105	
Red limy shale.....	10	115	
Sandstone, coarse.....	20	135	
Red limy shale and sandy shale.....	30	165	
Fire clay.....	5	170	
Sandstone and concealed, (Buffalo).....	45	215	
Fire clay.....	2	217	
Sandstone, shelly.....	6	223	
Fire clay and slate.....	2	225	
Sandstone, shelly.....25' } Mahoning .	68	293	293'
Sandstone, massive.....43 }			
Allegheny Series (132')			
Fire clay and coal, Upper Freeport	2	295	
Sandstone, ferruginous.....	16	311	
Coal and slate, Lower Freeport	4	315	
Sandstone, ferruginous.....	22	337	
Fire clay and coal?.....	3	340	
Sandstone, massive.....	58	398	
Fire clay	2	400	
Sandstone, massive.....	21	421	
Coal and slate, No. 5 Block	4	425	132'
Sandstone and concealed, Homewood , to 630' A. T. B.....	70	495	

The following section was measured with aneroid descending a hill from the east to the head of Sycamore creek, Union district, Lincoln county, 1 mile north of Bulger, P. O.

Sycamore Creek Section, Union District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (203')			
Sandstone	10	10	
Limestone	2	12	
Red shale.....	13	25	
Limestone, weathered.....	2	27	
Limestone and red shale.....	28	55	
Sandstone, massive, coarse, buff, (Saltsburg)	34	89	
Fire clay	1	90	
Red limy shale.....	5	95	
Sandstone, massive, coarse, (Buffalo and Mahoning)	108	203	203'
Allegheny Series (157')			
Fire clay, (Upper Freeport horizon).....	2	205	
Sandstone, massive, grayish buff, iron nodules	35	240	
Sandy shale	14	254	
Fire clay, Lower Freeport horizon.....	1	255	
Sandstone, sandy shale and concealed...	59	314	
Fire clay	1	315	
Sandstone, massive, coarse, friable.....	42	357	
Coal, No. 5 Block, to 875' A. T. B.....	3	360	157'

The two limestones near the top of this section probably come near the horizon of the Ames.

The following section was measured with aneroid descending a hill into Panther branch of Mud river, Union district, Lincoln county:

Panther Section, Union District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (139')			
Sandy shale.....	10	10	
Red limy shale.....	35	45	
Fire clay	1	46	
Sandstone, massive, coarse, (Buffalo)...	44	90	
Sandstone, sandy shale and sandstone, (Mahoning)	49	139	139'
Allegheny Series (181')			
Fire clay, Upper Freeport horizon.....	1	140	
Sandstone, coarse, ferruginous.....	29	169	
Fire clay, Lower Freeport horizon.....	1	170	
Sandstone, massive, coarse, buff.....	30	200	
Sandy shale	15	215	
Sandstone and sandy shale.....	70	285	
Sandstone, massive.....	33	318	
Coal, No. 5 Block, to 760' A. T. B.....	2	320	181'

The following section was measured with aneroid descending a hill to Mud river at a point $\frac{3}{4}$ mile south of Palermo, Jefferson district, Lincoln county:

Palermo Section, Jefferson District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (230')			
Limestone, reddish, red shale and concealed	40	40	
Limestone, hard, yellowish.....	1	41	
Limy, red shale.....	2	43	
Sandstone, flaggy, hard, buff, (Saltsburg)	37	80	
Red, limy shale....	5	85	
Sandstone and sandy shale.....	40	125	
Fire clay	2	127	
Sandstone, fine grained, flaggy.....	53	180	
Sandstone, sandy shale and concealed...	50	230	230'
Allegheny Series (136')			
Fire clay, Upper Freeport coal horizon..	4	234	
Sandstone, with iron nodules.....	21	255	
Fire clay, Lower Freeport horizon.....	5	260	
Sandstone, friable, massive, coarse grayish, buff	60	320	
Coal, blossom	3	323	
Sandy shale, sandstone and concealed...	42	365	
Coal, No. 5 Block	1	366	136'
Sandstone, massive, buff and sandy shale to bed of Mud river at 695' A. T. B....	49	415	

The following section was measured with aneroid descending a hill from the west into Laurel fork of Upton branch, Jefferson district, Lincoln county:

Upton Section, Jefferson District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (100')			
Sandstone, massive, friable.....	50	50	
Sandy shale.....	5	55	
Red shale	5	60	
Sandstone, sandy shale and concealed, (Mahoning)	40	100	100'
Allegheny Series (146')			
Fire clay, impure, Upper Freeport coal horizon	1	101	
Sandstone and sandy shale.....	24	125	
Fire clay, Lower Freeport coal horizon..	1	126	
Sandstone, massive, friable, gray.....	59	185	
Sandy shale, sandstone, and concealed..	60	245	
Coal blossom (No. 5 Block)	1	246	146'
Sandstone, massive, coarse, grayish buff (Homewood) to 840' A. T. B.....	74	320	

The following section was measured with aneroid descending a hill from the south of Radnor, Lincoln district, Wayne county:

Radnor Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (140')			
Sandstone and concealed.....	35	35	
Sandstone, massive, conglomeratic, friable, Buffalo-Mahoning	105	140	140'
Allegheny Series (191')			
Fire clay, Upper Freeport horizon.....	2	142	
Sandstone, sandy shale, and concealed...	26	168	
Fire clay, Lower Freeport horizon.....	3	171	
Sandy shale and concealed.....	34	205	
Fire clay.....	1	206	
Sandstone and concealed.....	39	245	
Fire clay	2	247	
Sandstone, massive, coarse, ferruginous..	83	330	
Fire clay (No. 5 Block).....	1	331	191'
Kanawha Series (209')			
Sandstone, friable, coarse, massive, (Homewood)	98	429	
Coal blossom, Lewiston.....	3	432	
Sandstone, massive, coarse.....	25	457	
Coal and slate.....	3	460	
Sandstone and concealed.....	49	509	
Coal blossom.....	1	510	
Sandstone to bed of Twelvepole, 615' A. T. B.....	30	540	290'

The following section was measured with aneroid descending into Sulphur Spring creek from the north, Duval district, Lincoln county:

Sulphur Spring Section, Duval District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (40')			
Sandstone and sandy shale.....	40	40	40'
Allegheny Series (167')			
Fire clay, Upper Freeport coal horizon...	2	42	
Sandstone, coarse, massive.....	70	112	
Sandy shale.....	10	122	
Sandstone, massive gray.....	28	150	
Fire clay, dark.....	2	152	
Sandstone, massive, coarse.....	50	202	
Sandy shale, (No. 5 Block coal horizon)	5	207	167'
Kanawha Series (73')			
Sandstone, massive.....33' }			
Sandy shale.....10' } Homewood	68	275	
Sandstone, massive.....25' }			
Coal, Stockton-Lewiston, to 845' A. T. B..	5	280	

The following section was measured with aneroid descending into Powder Mill branch from the south, about one mile from its mouth, Lincoln district, Wayne county:

Powder Mill Branch Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (150')			
Sandstone, massive, coarse, (Buffalo)...	46	46	
Fire clay, dark, Brush creek coal horizon	3	49	
Sandstone and concealed.....	47	96	
Fire clay	2	98	
Sandy shale and concealed.....	14	112	
Coal blossom and fire clay.....	2	114	
Sandstone, massive, friable.....	36	150	150'
Allegheny Series (135')			
Coal blossom, Upper Freeport	3	153	
Sandstone and sandy shale.....	30	183	
Coal blossom, Lower Freeport	2	185	
Sandstone, massive.....	99	284	
Coal and slate, No. 5 Block	1	285	135'
Sandstone and concealed, (Homewood)..	115	400	
Coal and slate, Stockton-Lewiston, to 650'			
A. T. B.....	5	405	

The following section was measured with aneroid descending from the west into Wells branch, Lincoln district, Wayne county:

Wells Branch Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (232')			
Red, limy shale.....	10	10	
Sandstone, massive, coarse.....	40	50	
Red shale	40	90	
Fire clay	5	95	
Limy shale	5	100	
Yellow and sandy shale.....	26	126	
Limestone	2	128	
Sandy shale.....	40	168	
Limy shale, reddish (weathered red)...	2	170	
Fire clay	3	173	
Sandstone, massive, friable (Mahoning)..	59	232	232'
Allegheny Series (178')			
Fire clay, Upper Freeport coal horizon ...	3	235	
Sandstone, massive, coarse cliffs.....	170	405	
Fire clay, No. 5 Block coal horizon	5	410	
Kanawha Series (255')			
Sandstone, massive, coarse, to small bench, (Stockton-Lewiston coal horizon)	60	470	
Sandstone, (Coalburg)	85	555	

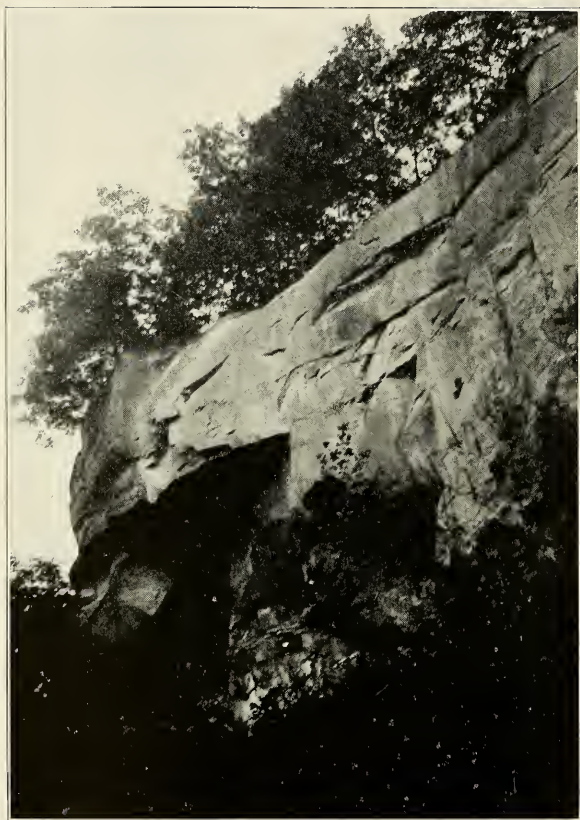


PLATE XIV.—“Homewood” Sandstone Cliff near
Saltpeter, Wayne County.



PLATE XV.—Rock Quarry in “Homewood” Sandstone, Saltpeter,
Wayne County.

	Thickness Feet.	Total Feet.	
Coal and slate, Coalburg.....	3	558	
Sandstone, massive, Winifrede.....	57	615	
Coal and fire clay, Winifrede.....	3	618	
Sandstone, massive and flaggy to N. & W. R. R. track, at 705' A. T. B.....	47	665	255'

The following section was taken descending a hill at Saltpetre, Lincoln district, Wayne county:

Saltpetre Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (75')			
Sandstone and shale....60' }			
Sandy shale and sandstone' .....15' }	Mahoning 75	75	75'
Allegheny Series (195')			
Fire clay and coal, Upper Freeport.....	5	80	
Sandy shale and sandstone.....	23	103	
Slate and fire clay, Lower Freeport.....	2	105	
Sandstone, flaggy, Lower Freeport.....	40	145	
Sandy shale and concealed.....	8	153	
Sandstone, friable.....63' }			
Sandstone and concealed.19' }	East Lynn 82	235	
Sandstone and shale.....	15	250	
Slate, black.....4" }			
Coal and slate, inter-laminated .....4' }			
Coal, semi-cannel.....5' }			
Slate and coal.....6' }	No. 5 Block 5	255	
Coal .....4' }			
Coal and slate.....4' }			
Coal, gray splint, block.2' }			
Coal and lime.....3' }			
Fire clay.....4' }			
Sandstone	14	269	
Coal, Clarion	1	270	195'
Kanawha Series (85')			
Sandstone, (Homewood).....	53	323	
Coal and slate.....	2	325	
Sandstone and sandy shale.....	19	344	
Coal and slate.....1' }			
Shale .....7' }	Stockton-Lewiston.		
Coal and slate, to 545' }	11	355	85'
A. T. B.....3' }			

The following section was taken descending a hill from the west into Cincho branch of East fork of Twelvepole, one mile west of Cove Creek P. O., Stonewall district, Wayne county:

Cincho Branch Section, Stonewall District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (210')			
Red, limy shale.....	18	18	
Sandstone, dark gray, coarse.....	7	25	
Red, limy shale.....	25	50	
Sandstone, nodules of iron ore.....	28	78	
Fire clay	2	80	
Limy shale.....	2	82	
Sandstone, (Buffalo).....	33	115	
Fire clay and concealed.....	10	125	
Limy shale with limestone.....	5	130	
Sandstone, iron ore nodules.....	35	165	
Fire clay, coal and slate.....	5	170	
Sandstone, massive, coarse, (Mahoning)	40	210	210'
Allegheny Series (140')			
Slate and fire clay, Upper Freeport	5	215	
Sandy shale and concealed.....	15	230	
Fire clay and iron ore, Lower Freeport ..	2	232	
Sandstone, massive, iron ore nodules....	48	280	
Fire clay, coal and slate.....	5	285	
Sandstone, massive.....	60	345	
Coal and slate, No. 5 Block	5	350	140'
Sandstone and concealed, Homewood , to 710' A. T. B.	50	400	

The preceding sections give the thickness of the Allegheny series from 120 to 225 feet in the Cabell-Wayne-Lincoln area.

Dr. I. C. White discusses the structure and thickness of the Allegheny series as exposed in the northern part of the State in Volume II, West Virginia Geological Survey, pages 338 to 355, to which the reader is referred. He also publishes a list of fossil plants which characterize the Allegheny and Pottsville series in the same volume. In Volume II (A), page 494, he gives the following statement in regard to the Allegheny series.

COALS BELOW THE LOWER KITTANNING BED.

"If we accept the conclusion that the Roaring Creek sandstone of Randolph county and the great sandstone which overlies the Kanawha Black Flint horizon in the southwestern portion of the State is really the top member of the Pottsville series of Western Pennsylvania and therefore, the equivalent of the Homewood sandstone, it follows that there is practically no commercial coal in the Allegheny series of

West Virginia below the Lower Kittanning seam. True, a bed of coal sometimes occurs in the middle of this great sandstone deposit, but with the exception of one locality near Leiter on the Tygart Valley river, Randolph county, it has not been mined for commercial purposes. Hence, the Clarion coal with the exception of the section at Valley Falls, Taylor county, and a few localities in Preston county, may be considered as absent from the measures in West Virginia, as far as holding valuable coal is concerned."

TABLE OF FORMATIONS.

In the Northern Part of the State.	In the Southern Part of the State.
Upper Freeport Coal.	Upper Freeport Coal.
Upper Freeport Limestone.	Upper Freeport Sandstone.
Bolivar Fire Clay.	Lower Freeport Coal.
Upper Freeport Sandstone.	Lower Freeport Limestone.
Lower Freeport Coal.	Lower Freeport Sandstone.
Lower Freeport Limestone.	Middle Kittanning Coal
Upper Kittanning Coal.	(North Coalburg).
Middle Kittanning Coal.	East Lynn Sandstone.
Lower Kittanning Coal.	Lower Kittanning Coal (No.
Lower Kittanning Clay.	5 Block).
Lower Kittanning Sandstone.	Clarion Sandstone.
Vanport (Feriferous) Lime-	Clarion Coal.
stone.	
Clarion Sandstone.	
Clarion Coal.	
Clarion Clay.	

The Upper Freeport Coal.

The roof of the Upper Freeport coal is the top of the Allegheny series. In the northern portion of West Virginia, this is one of the most important coal seams of the Allegheny series, and ranks next to the Pittsburgh bed.

In Cabell the Upper Freeport coal is exposed to the surface only in the extreme southern edge of the county and

is there thin and of very little commercial value. No core drill holes have been sunk to test for the coal, but from oil well records it is more than probable that this coal seam is thin or absent.

In Lincoln the Upper Freeport coal begins to come above the surface along the streams in the northern part of the county, and rises gradually to the southeast, until at the southern part of the same the coal is from 500 to 600 feet above water level.

The Upper Freeport coal is mined for local fuel use in several localities throughout the northern and central parts of the county. It is mined around Hamlin and Griffithsville and before the discovery of natural gas this coal was the only fuel used in those regions.

Measurements of this bed showing the structure and character of the coal were taken at all the openings in which it was possible to get a section, and these measurements will now be given by districts:

UPPER FREEPORT COAL—CARROLL DISTRICT.

Opening No. 41 is located N 45° E, 3 miles from Hamlin along Buffalo creek on land of Jesse Wilkinson and the coal was once mined here, but the mine is now abandoned. The opening shows the following section:

Section of Jesse Wilkinson's Coal Opening.

	Ft.	In.
Sandstone, massive, Mahoning		
Soft slate.....	3	0
Coal, hard.....0' 7" }		
Soft fire clay.....0 1 }	2	5
Coal, hard, blocky.....1 9 }		

Opening No. 42 is located N 45° E, 2 $\frac{7}{8}$ miles from Hamlin along Buffalo creek on land of Jesse Wilkinson, where the coal is being mined for local fuel use, and the following section was measured:

Section of Jesse Wilkinson's Coal Opening.

	Ft.	In
Sandstone, Mahoning.....		
Slate roof.....	3	0
Coal, slightly bony.....1' 6" }	2	6
Coal, hard, visible 650' }		
A. T. B.....1 0 }		
Butts run N 42° W, faces N 48° E; greatest rise S 12° E.		

The bony coal burns very freely, but appears impure and makes a large amount of ash. Samples for analyses were taken from the two sections of coal. Mr. Wilkinson usually mines about 2,000 bushels of coal annually for local fuel use.

Opening No. 43 is located along Mud river, N 56° E, ½ mile from Hamlin on land of Dr. W. W. Baker, where the coal has been mined for local fuel use, and exhibits the following sections:

Section of Dr. W. W. Baker's Coal Opening.

	Ft.	In.
(1) Sandstone, massive, coarse, Mahoning		
(2) Slate and shale.....	0	2
(3) Coal, soft.....0' 5" }	3	2½
(4) Slate .....0 ¼ }		
(5) Coal, medium hard.0 10 }		
(6) Slate, band.....0 ⅛ }		
(7) Coal, soft.....0 5 }		
(8) Slate, band.....0 ⅛ }		
(9) Coal, soft, gas.....0 4 }		
(10) Coal, medium hard.1 2 }		
(11) Fire clay floor, 660' A. T. B.....		
Sample taken for analysis from Nos. 3, 5, 7, 9, and 10.		
Butts run N 43° W; faces N 47° E; greatest rise, S 12° E.		

Hamlin was formerly supplied with coal from this mine.

Opening No. 44 is located N 85° E, one mile and a quarter from Hamlin along Mud river on land of James Powell where the coal is mined for local fuel use, and exhibits the following section:

Section of James Powell's Coal Opening.

	Ft.	In.
Shale roof.....		
Coal, hard, block.....0' 11" }	2	8
Coal, soft, gas.....0 5 }		
Coal, hard, block.....1 4 }		
Fire clay bottom, 660' A. T. L.....		
Butts run N 43° W; faces N 47° E; greatest rise, S 12° E.		
Sample taken for analysis.		

Mr. Powell usually mines about 5,000 bushels annually for local fuel use. The coal has a black, rich, glossy appearance and appears to be an excellent fuel coal.

Opening No. 45 is located one mile and a quarter from Hamlin along Mud river on the land of Aaron Martin, where the coal is mined for local fuel use by Messrs. Richard and William Stanley, and exhibits the following section:

Section of Aaron Martin's Coal Opening.

		Ft.	In.
(1) Slate roof.....			
(2) Coal, impure.....	0' 4"		
(3) Coal, soft.....	0 4		
(4) Slate	0 1/4	3	0 1/4
(5) Coal, medium hard, block	2 4		
Slate floor, 665' A. T. L.....			
Butts run N 43° W; faces N 47° E; greatest rise S 14° E.			
Sample taken for analysis from Nos. 2, 3 and 5.			

The coal mines easily and makes an excellent fuel coal.

Opening No. 46 is located on land of Alex. Wheeler along Middle fork of Mud river, N 85° E, one mile and a quarter from Hamlin, where the coal is mined for local fuel use by W. M. Bench, and exhibits the following:

Section of Alex. Wheeler's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, hard, blocky, good.....	3	1
Slate floor, 665' A. T. B.....		
Butts run N 43° W; faces N 47° E; greatest rise, S 12° E.		

The capacity of the mine is usually about 5,000 bushels annually which is mined for local fuel use. The slate partings in the coal at previous openings appear to have disappeared, and the measurement shows a clean section.

Opening No. 47 is located S 77½° E, 2 miles from Hamlin along Middle fork of Mud river, where the coal was once mined for local fuel use, but is now abandoned. Elevation of coal, 670' A. T. B.

Opening No. 48 is located S 50° E, 2¾ miles from Ham-

lin along Middle fork of Mud river where the coal was once mined, but is now abandoned. Elevation, 675' A. T. B.

Opening No. 49 is located along Middle creek of Mud river, S 54° E, $2\frac{1}{2}$ miles from Hamlin, on the land of Daniel Pridmore, where the coal is mined for local fuel, and exhibits the following section:

Section of Daniel Pridmore's Coal Opening.

		Ft.	In.
(1) Shale roof.....			
(2) Coal, interlaminated	}	3	1
with slate.....0' 6"			
(3) Coal, medium hard			
block .....2 7			
(4) Fire clay floor, 675' A. T. B.....			
Butts run S 43° W; faces N 47° E; greatest rise, S 12° E.			
Samples for analysis taken from Nos. 2 and 3.			

The coal in No. 2 is interlaminated with layers of slate, but burns freely, and makes a large amount of ash. The coal in section 3 has a fine black, glossy appearance, burns freely and forms an excellent fuel coal.

Openings Nos. 50, 51, 52 and 53 have been abandoned and no measurements of the coal could be obtained.

Opening No. 50 is located on Mud river, N 37° W, 2 miles from Hamlin; elevation of coal, 715 feet.

Opening No. 51 is located on Big creek, S 44° W, $3\frac{1}{4}$ miles from Hamlin; elevation of coal, 725 feet.

Opening No. 52 is located on Big creek, S $40\frac{1}{2}^{\circ}$ W, $3\frac{1}{4}$ miles from Hamlin; elevation of coal, 745 feet.

Opening No. 53 is located on Laurel creek, S $18\frac{1}{4}^{\circ}$ W, 4 miles from Hamlin; elevation of coal, 725 feet.

Opening No. 54 is located on the land of David Miller, Laurel creek, S $18\frac{1}{2}^{\circ}$ W, $4\frac{1}{4}$ miles from Hamlin, where the following section was measured:

Section of David Miller's Coal Opening.

		Ft.	In.
Sandstone roof.....		0	6
Slate		0	6
Coal and slate.....1' 0"	}	1	6
Coal, block.....0 1			
Slate			
Coal, 745' A. T. B.....0 1			

Opening No. 55 is located on the land of William Black, Laurel creek, S $14\frac{1}{2}^{\circ}$ W from Hamlin, where the coal is mined for local fuel and exhibits the following structure:

Section of William Black's Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal, soft.....	0'	1"		
Coal, hard, splint.....	1	1		
Coal, soft.....	0	11		
Slate	0	1		
Coal, block, hard.....	0	5		
Elevation, 725' A. T. B.				
Butts run N 40° W; faces N 50° E; greatest rise, S 12° E.				

Opening No. 56 is located on Scary creek, N $82\frac{1}{2}^{\circ}$ W of Griffithsville where the coal was once mined, but it is now abandoned; elevation, 725' A. T. B.

Opening No. 57 is located on the land of Ernest Keeton, Scary creek, N 79° W, $2\frac{3}{4}$ miles from Griffithsville where the coal is mined for local fuel, and exhibits the following structure:

Section of Ernest Keeton's Coal Opening.

		Ft.	In.
Slate and shale roof.....			
Coal, medium hard.....		3	1
Fire clay floor, 700' A. T. B.....			

Samples for analyses were taken here.

The coal is an excellent fuel for domestic purposes.

Opening No. 58 is an abandoned mine located on Scary creek, N $75\frac{1}{2}^{\circ}$ W. $2\frac{1}{2}$ miles from Griffithsville; elevation 700' A. T.

Opening No. 58 (a) is located on the land of Henry Miller near the mouth of Scary creek, N 70° W, $2\frac{3}{4}$ miles from Griffithsville where the coal is mined for local fuel, and exhibits the following structure:

Section of Henry Miller's Coal Opening.

	Ft.	In.
(1) Slate and shale roof.....		
(2) Coal, interlaminated with slate.....	0	4
(3) Coal, block.....	2	0
(4) Slate floor, 675' A. T. B.....		
Butts run N 43° W; faces N 47° E; greatest rise, S 14° W.		

Sample taken from Nos. 2 and 3.

There is usually about 1,000 bushels of coal mined annually at this opening.

UPPER FREEPORT COAL IN DUVAL DISTRICT.

Duval district lies east of Carroll and the Upper Freeport coal crops out along Mud river and its tributaries, which flow through it on the east and north. The coal has been mined at Griffithsville to supply fuel for the town and farmers in the surrounding neighborhood, and several openings have been developed there.

Opening No. 59 is located in Griffithsville on land of Henry Miller, where the following section was measured:

Section of Henry Miller's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, good.....	3	2
Fire clay floor, 685' A. T. L.....		
Butts run N 47° W; faces N 42° E; greatest rise, S 12° E.		

There are usually about 1,000 bushels mined here annually.

Opening No. 60 is located N 27½° E, ½ mile from Griffithsville on the lands of John Stowers along the waters of Valley fork, where the following section was measured:

Section of John Stower's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, slightly bony.....0' 6" }	2	7
Coal, splint.....1 7 }		
Coal, medium hard.....0 6 }		
Fire clay floor, 690' A. T. B.....		
Butts run N 42° W; faces S 48° E; greatest rise, S 12° E.		

There is usually mined here about 4,000 bushels annually.

Opening No. 61 is located on the property of the Virginia Land Company on Straight fork of Mud river, where the following section was measured:

Section of Virginia Land Company's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, slightly bony.....	0	6
Coal, splint.....	1	8
Coal, gas.....	0	8
Fire clay bottom, 686' A. T. L.....		
Butts run N 42° W; faces N 48° E.		

Sample for analysis taken here, where the opening is driven in under the surface about 50 feet.

Opening No. 62 is located on Porter fork, where the coal was once mined, but is now abandoned; elevation of coal, 800' A. T. B.

Opening No. 63 is located on Straight fork of Mud river, S 47° E, 4½ miles from Griffithsville, near Snowden on the land of Bird Kingery, where the coal was formerly mined, but now abandoned; elevation, 891' A. T. L.

Opening No. 64 is located on Straight fork of Mud river, S 54° E, 5 miles from Griffithsville on the land of J. W. McClure, where the coal is mined for local use, and exhibits the following section:

Section of J. W. McClure's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Slate	2	0
Coal and slate interlam- inated .....0' 2"	3	5
Slate .....0 3		
Coal, splint.....0 2		
Slate .....0 5		
Coal, hard.....0 3		
Fire clay.....0 2		
Coal, hard.....2 0		
Fire clay floor, 897' A. T. L.....		

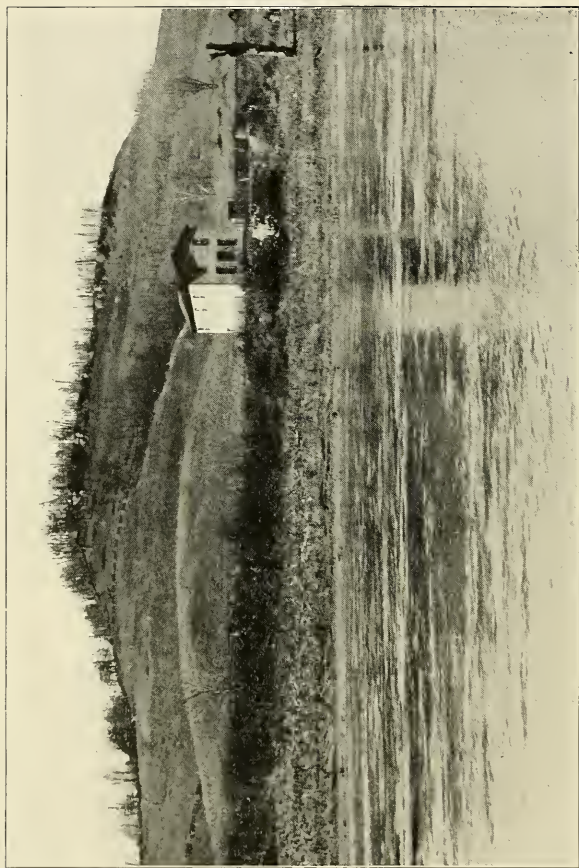


PLATE XVI.—Scene on Coal River, near Forks of Coal, Showing the
Saltsburg Sandstone, Top of Hill.

The Upper Freeport coal comes to the surface on the waters of Joes creek and Williams fork of Trace fork of Mud river, near the central part of Duval district, where several openings have been made.

Opening No. 65 is an abandoned mine located on Joes creek N 73° E, 4 miles from Griffithsville near Tango P. O., on land of Mohler et al; elevation 800' A. T. B.

Opening No. 66 is located on Williams fork, N $54\frac{1}{2}^{\circ}$ E, $5\frac{1}{2}$ miles from Griffithsville on land of L. V. Goode, where the coal was once mined, but now abandoned; elevation 755' A. T. B.

UPPER FREEPORT COAL IN WASHINGTON DISTRICT.

Washington district is located east of Duval and along the eastern border of Lincoln county. The Upper Freeport coal comes to the surface in this district on the waters of Fuquay, Cobbs and Horse creeks.

Opening No. 67 is located on Fuquay creek N $75\frac{1}{2}^{\circ}$ W, $2\frac{1}{2}$ miles from Sproul and about $\frac{1}{2}$ mile north of Priestley, at 680' A. T. L., where it crops at an abandoned mine.

Opening No. 68 is located N 50° W, 3 miles from MacCorkle on the property of the Seaboard Fuel Company along the waters of Cobbs creek, where the coal has been mined for local fuel, and exhibits the following:

	Ft.	In.
Sandstone, massive, Mahoning.....		
Slate	0	10
Coal, interlaminated with slate .....2' 0" }	4	0
Coal, hard.....2 0 }		
Fire clay floor, 775' A. T. L.....		

Opening No. 69 is located N $53\frac{1}{2}^{\circ}$ W, three miles from MacCorkle on the land of Benton Pauley along the waters of Cobbs creek, where the coal is mined for local use, and exhibits the following section:

Section of Benton Pauley's Coal Opening.

			Ft.	In.
Sandstone, massive, Mahoning.....				
Coal and slate.....	1' 6"	}	6	7
Coal, hard.....	2 10			
Coal and slate.....	0 6			
Coal, hard, blocky.....	0 4			
Slate	0 3			
Coal, soft.....	1 2	}		
Fire clay floor, 765' A. T. L.....				

The opening has been driven under the surface for about 200 feet.

Opening No. 70 is located on Ely fork of Cobbs creek, S 70° W, 3¼ miles from MacCorkle, on the property of the Seaboard Fuel Company, where a prospect opening has been made, and the following section measured:

Section of Seaboard Fuel Company's Coal Opening.

			Ft.	In.
Sandstone, massive, Mahoning.....			50	0
Slate and coal.....	3' 0"	}	4	0
Coal, block.....	1 0			
Fire clay.....				
Sandstone, 890' A. T. B.....				

Opening No. 71 is located on Peters Cave fork of Horse creek, S 71° W, 2½ miles from Woodville, on the property of C. Wilkinson, where the following section was measured:

Section of C. Wilkinson's Coal Opening.

			Ft.	In.
Sandstone, massive, Mahoning.....				
Coal, interlaminated with slate	0' 8"	}	4	6
Coal, hard.....	1 6			
Slate	0 8			
Coal and slate.....	1 0			
Coal, hard, block.....	0 8			
Fire clay floor, 960' A. T. B.....				

The coal is mined for local fuel.

Opening No. 71-A is located on Vickers fork of Peter Cave of Horse creek, S 74° W, 3 miles from Woodville, on the land of Richard Huffman, where the following section ing section was measured:

Section of Richard Huffman's Coal Opening.

		Ft.	In.
Sandstone, massive, Mahoning.....			
Coal	0' 6"	}	3 4¾
Slate	0 1		
Coal	1 2		
Slate	0 1		
Coal	0 6		
Slate	0 ¾		
Coal, visible, 925' A. T. B.	1 3		

Opening No. 71-B is an abandoned mine located on Vickers fork of Peter Cave, S 70° W, 3¼ miles from Woodville on the property of Edward Vickers; elevation, 950' A. T. B.

Opening No. 72 is located on the headwaters of Peter Cave, S 65° W, 3¼ miles from Woodville, where the following section was measured.

		Ft.	In.
Sandstone roof, Mahoning.....			
Coal	1' 2"	}	2 4
Slate	0 2		
Coal, 996' A. T. L.....	1 0		

UPPER FREEPORT COAL IN JEFFERSON DISTRICT.

Jefferson district lies south of Union and south of the center of Lincoln county. The Upper Freeport coal occurs in the hills from 150 to 225 feet above the floor of the valleys.

Opening No. 73 is located on the headwaters of Left fork of Mud river, S 65° W, 3½ miles from Woodville; elevation, 990' A. T. B. The opening had fallen in and no section was measured.

Opening No. 74 is located on Dogbone branch of Mud river on the property of the Lincoln Land Association, S 53½° W, 4½ miles from Woodville, where the following section was measured:

Section of Lincoln Land Association's Coal Opening.

	Ft.	In.
Sandstone, Mahoning.....		
Slate	0	3
Coal	1' 1"	}
Slate	0 1	
Coal	0 8	
Slate	0 1	
Coal	0 6	}
Fire clay floor, 1020' A. T. B.....	2	5

UPPER FREEPORT COAL IN UNION DISTRICT.

Union district is south of Carroll and Duval districts and near the center of Lincoln county. The Upper Freeport coal occurs in the hills 25 feet to 150 feet above the floor of the valleys.

Opening No. 75 is located on Sycamore fork of Mud river, S 28° W, 3¾ miles from Griffithsville on the land of S. W. Oxley, where the following section was measured:

Section of the S. W. Oxley's Coal Opening.

	Ft.	In.
Slate and shale.....	5	0
Coal, block, good.....	3	1
Fire clay and slate floor, 825' A. T. B.....		

There is usually about 1200 bushels of coal mined annually here, and used for local fuel.

Opening No. 76 is located on Laurel creek, S 50° W, 4 miles from Griffithsville on land of Mrs. Mary Plummer, where the following section was measured:

Section of Mrs. Mary Plummer's Coal Opening.

	Ft.	In.
Shale and slate roof.....		
Coal, block, good.....	0' 8"	}
Fire clay and shale.....	2 2	
Coal, block.....	0 3	
Slate	0 2	
Coal, bony.....	0 3	}
Slate	0 1	
Coal, slate and bone.....	0 6	
Slate bottom, 830' A. T. B.....	4	1

The coal is mined for local fuel use, and usually about 1200 bushels annually.

Opening No. 77 is located on Laurel creek, S. $61^{\circ} 30'$ W, $4\frac{3}{4}$ miles from Griffithsville where a prospect opening was once made, but is now abandoned and no measurement could be taken; elevation, 805' A. T. B.

UPPER FREEPORT COAL IN SHERIDAN DISTRICT.

Sheridan district lies west of Carroll district in the western part of Lincoln county, and is drained by the Guyandot river, which runs through the entire length of the county. The Upper Freeport coal occurs in the hills from 25 to 400 feet above the floor of the valley in this district.

Opening No. 78 is located on Mill branch of Six Mile, S $73\frac{1}{2}^{\circ}$ E, $2\frac{1}{4}$ miles from Branchland, on the land of J. L. Caldwell, where the coal is mined for local use, and exhibits the following section:

Section of J. L. Caldwell's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, interlaminated with slate	0' 6"	4	5
Fire clay.....	2 0		
Slate	0 2		
Coal, hard, blocky.....	1 0		
Slate	0 1		
Coal, soft, visible, 865' A. T. B.....	0 8		

Opening No. 79 is located on Sulphur Spring branch of Mud river, S 51° W, $3\frac{3}{4}$ miles from Branchland on the lands of Beckelheimer, where the coal is mined, and exhibits the following section:

Section of Beckelheimer's Coal Opening.

		Ft.	In.
Sandstone roof, Mahoning.....			
Slate		1	0
Coal, hard, blocky.....0' 2"	}		
Slate			
Coal			
Slate			
Coal, hard.....0 2		2	6
Fire clay.....0 10			
Coal, hard, blocky, visible,			
775' A. T. B.....1 0			

Opening No. 80 is located on Kentuck branch of Four Mile, S 71° W, 3¼ miles from Branchland on the land of J. M. Dial, where the coal was once mined, but is now abandoned; elevation, 740' A. T. B.

Opening No. 81 is located on Kentuck branch of Four Mile creek, S 78° W, 3 miles from Branchland on the property of the Guyandotte Land Association, where the coal was once mined; elevation, 730' A. T. B.

In Wayne county the Upper Freeport coal crops to the surface along the Ohio river, and then dips under water level southward into the Parkersburg Syncline, attaining its lowest point near Prichard, and then gradually rising again until at the southern part of the county, this coal horizon misses the tops of the highest hills.

UPPER FREEPORT COAL IN CEREDO DISTRICT.

The Upper Freeport coal crops in the hills along Big Sandy river south of Kenova in this district for a short distance.

Opening No. 81(a) is located along Mill creek, about ½ mile from its mouth, where on the land of W. C. Payne the coal is mined for local use, and exhibits the following section:

Section of W. C. Payne's Coal Opening.

	Ft.	In.
Sandstone roof, Mahoning.....		
Slate	1	2
Coal	2	6
Fire clay floor, 535' A. T. B.....		

UPPER FREEPORT COAL IN STONEWALL DISTRICT

Stonewall district lies in the eastern part of Wayne county and north of Grant district. The Upper Freeport bed occurs in the hills, 25 to 300 feet above the valleys in this district.

Opening No. 82 is located along the Right fork of Beech, N 40° E, 5 miles from East Lynn, on land of Thomas G. Mills, where the following section was measured:

Section of Thomas G. Mills' Coal Opening.

	Ft.	In.
Sandstone, Mahoning		
Shale, slaty.....	8	0
Coal, blocky.....	1	10
Slate floor, 740' A. T. Aneroid.....		

UPPER FREEPORT COAL IN UNION DISTRICT.

Union district lies west and north of Stonewall and south of Ceredo district.

Opening No. 83 is located on the Left fork of Miller fork of Beech N 25° E, 4½ mile from East Lynn on the property of Millard Lester where the following section was measured:

Section of Millard Lester's Coal Opening.

	Ft.	In.
Shale roof.....		
Coal, good.....0' 8" }	5	8
Fire clay.....4 0 }		
Coal, soft, visible, 710' }		
A. T. B.....1 0 }		

Opening No. 84 is located N 7+° E, ¾ miles from East Lynn along Miller fork of Beech, on land of Kirby Adkins, where the following section was measured:

Section of Kirby Adkins' Coal Opening.

	Ft.	In.
Shale roof.....		
Slate	2	0
Coal, good, visible, 670' A. T. B.....	2	3

Opening No. 85 is located just east of the N. & W. Railroad at Wayne, where the coal was once mined, but the opening is now abandoned; elevation, 640' A. T. B.

Opening No. 86 is located S 80° E, 1¾ miles from Wayne near Elmwood on the property of the Guyandotte Land Association, where the coal was once mined, but the opening is now abandoned; elevation, 650' A. T. B.

UPPER FREEPORT COAL IN BUTLER DISTRICT.

Butler district lies west of Union and along the western boundary of Wayne county. The Upper Freeport coal occurs in the hills from 20 to 400 feet above the floor of the Big Sandy and Tug Fork valleys.

Opening No. 87 is located along the West fork of Twelvepole, one-half mile south of Coleman on the land of J. J. Smith where the following section was measured:

Section of J. J. Smith's Coal Opening.

	Ft.	In.
Shale roof.....		
Slate	0	10
Coal, hard.....	0	10½
Slate	1	1
Coal, bony.....	0	1
Coal, splint.....	0	11
Slate floor, 665' A. T. A.....		

Opening No. 88 is located along Wilson creek S 60° E, 5 miles from Fort Gay on the lands of Marion Smith, where the following section was measured:

Section of Marion Smith's Coal Opening.

	Ft.	In.
Sandstone, massive, Mahoning.....		
Slate and fire clay.....	5	0
Shale	1	3
Coal, soft.....	1	1
Slate and coal.....	1	0
Coal, good.....	0	10
Fire clay bottom, 820' A. T. B.....		

Opening No. 89 is located at Hubbardstown on Big Sandy river where the coal was once mined and shipped down the river on flat boats. The opening is now abandoned, but is reported as $2\frac{1}{2}$ feet thick; elevation of coal, 592' A. T. L.

UPPER FREEPORT COAL IN LINCOLN DISTRICT.

Lincoln district is located south of Stonewall and Butler and west of Grant district in the southern part of Wayne county. The Upper Freeport coal occurs in the hills from 75 to 500 feet above the floor of the valleys.

Opening No. 90 is located along Jackson branch of the West fork of Twelvepole on the lands of James Robinson S $60\frac{1}{2}^{\circ}$ W, one mile and a half from Genoa, where it is mined for local use and the following section was measured:

Section of James Robinson's Coal Opening.

		Ft.	In.
Shale roof.....			
Coal, soft.....	0' 11"		
Slate	0 4		
Coal, blocky.....	0 6	2	7
Coal, bony.....	0 2		
Coal, blocky.....	0 8		
Fire clay floor, 767' A. T. L.....			

In the southern part of Wayne county the Upper Freeport coal crops high above the floor of the valleys and as there are several seams of coal nearer the latter, no openings have been made in this bed.

A summary of the thicknesses of the coal in the foregoing described openings as well as the results of the analysis of those which were sampled, will be given in a subsequent chapter.

The Upper Freeport Sandstone.

Underneath the Upper Freeport coal there occurs a sandstone from 20 to 40 feet thick, medium coarse and often

massive, that would correspond with the Upper Freeport sandstone of Pennsylvania. The vertical sections already given on previous pages reveal the character of this stratum.

The Lower Freeport Coal.

At an interval of 20 to 50 feet below the Upper Freeport coal comes occasionally another vein which would correlate with the Lower Freeport bed.

This coal is thin and of very little economic importance in the Cabell-Wayne-Lincoln area. Very little development has been made on the vein, but wherever it has been opened, there is usually less than 18 inches of coal.

In Cabell county the Lower Freeport coal does not rise above the surface, except for a short distance along Guyandot river near the Cabell-Lincoln line.

In Lincoln county the Lower Freeport coal has been opened on Guyandot river at the mouth of Falls creek by W. F. Bills, where at opening No. 91 the following section was measured:

Section of W. F. Bills' Coal Opening.

	Ft.	In.
Coal crop, Upper Freeport		
Sandstone	40	40
Slate	2	42
Coal, good, 570' A. T. B.....	1'4"	43'4"
Slate with iron nodules.....		

In Wayne county, the Lower Freeport coal crops south of the Parkersburg Syncline and is opened in several places, but the openings indicate that the coal is not thick enough to be of much commercial importance.

Opening No. 92 is located on Millers fork of Beech creek, N 82° E, 5¼ miles from Wayne on the land of John Gilker son, where the coal is mined for local use, and the following section was measured:

Section of John Gilkerson's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Shale with lime nodules.....		4	0
Slate and fire clay.....		4	0
Coal, hard.....1' 6"	}		
Slate .....0 ¼			
Coal, medium hard, blocky		1'	2¼
665' A. T. B.....0 8	}		

Opening No. 93 is located at Hubbardstown on Big Sandy river, Butler district, where this seam was once mined and shipped down the stream. The opening had fallen in and no section was measured. The coal is reported to be 1' 10" thick; elevation, 557' A. T. L.

The Lower Freeport Limestone.

Below the Lower Freeport coal a limestone is occasionally present in the area under discussion. This limestone often appears in nodular masses containing so much iron as to be a low grade ore, and is non-fossiliferous. It usually occurs just under the Lower Freeport coal, but sometimes is from 1 to 10 feet below the coal, and from 6" to 18" thick. It would correlate with the Lower Freeport or Butler limestone of Pennsylvania.

A sample collected near Kenova, Wayne county, and analyzed in the laboratory of the W. Va. Geol. Survey by Mr. J. B. Krak, Assistant Chemist, gives the following results:

	Per cent.
Silica (Si O ₂).....	24.74
Ferrous Carbonate (Fe CO ₃).....	59.03
Alumina (Al ₂ O ₃).....	8.77
Manganese Dioxide (Mn O ₂).....	0.56
Calcium Carbonate (Ca CO ₃).....	4.06
Magnesium Carbonate (Mg CO ₃).....	2.49
Phosphoric Acid (P ₂ O ₅).....	0.57
Total	100.22

This limestone is present in Lincoln and Wayne counties and can easily be recognized from its nodular appearance.

A sample of this limestone, or iron ore rather, was collected near Yawkey, Duval district, Lincoln county, and as analyzed in the laboratory of the West Virginia Geological Survey by Mr. J. B. Krak, Assistant Chemist, gave the following results:

	Per cent.
Silica (Si O_2).....	20.75
Ferric Iron (Fe_2O_3).....	10.42
Ferrous Carbonate (Fe CO_3).....	59.72
Alumina (Al_2O_3).....	6.07
Manganese Dioxide (Mn O_2).....	0.89
Calcium Carbonate (Ca CO_3).....	1.24
Manganese Carbonate (Mg CO_3).....	0.71
Phosphoric Acid (P_2O_5).....	0.65
Total	100.45

The Lower Freeport limestone ore crops on the road near Griffithsville and is scattered along the road in large boulders, one to three feet in diameter. A sample was collected near Griffithsville and as analyzed in the laboratory of the W. Va. Geol. Survey by Mr. J. B. Krak, gave the following results:

	Per cent.
Silica (Si O_2).....	37.27
Ferric Iron (Fe_2O_3).....	2.39
Ferrous Carbonate (Fe CO_3).....	44.51
Alumina (Al_2O_3).....	9.93
Calcium Carbonate (CaCO_3).....	3.48
Magnesium Carbonate (Mg CO_3).....	2.18
Total	99.76

From 10 to 15 feet below the Lower Freeport coal is a heavy, massive sandstone from 15 to 50 feet thick, usually coarse grained and often containing pebbles of iron ore, and frequently current bedded. This sandstone is separated by a layer of shale and fire clay and often a thin seam of coal from an underlying stratum of sandstone, which would correlate with the Lower Freeport sandstone of Pennsylvania. This Lower Freeport sandstone forms bold cliffs on Coal, Mud, Guyandot and Big Sandy rivers.

Upper Kittanning Coal (North Coalburg?).

Below the Lower Freeport sandstone there often occurs a bed of coal 2 to 3 feet thick that possibly represents the North Coalburg or Upper Kittanning bed. In the Cabell-Wayne-Lincoln area this coal occurs at several localities and occasionally has been mined, but it is usually thin and of little importance.

In Lincoln county on Brush fork of Horse creek, this coal bed shows the following section:

	Ft.	In.
Sandstone, massive, Lower Freeport		
Coal, hard, blocky, 830' A. T. B.....	1	2
Sandstone, massive.....		

In Wayne county what appears to be this same bed is mined on the West fork of Twelvepole, 3 miles southwest of Wayne, where it has the following section:

	Ft.	In.
Sandstone, massive, Lower Freeport		
Coal, 670' A. T. B.....	18"	to 30
Sandstone		

This coal is frequently absent, but is nearly always represented by slate or fire clay.

The East Lynn Sandstone.

Under the North Coalburg (Upper Kittanning) coal, is a massive sandstone from 50 to 100 feet in thickness that the writer has called the **East Lynn sandstone**.

The East Lynn sandstone as designated in this volume will be the stratum of rock lying between the North Coalburg coal and the No. 5 Block coal (Middle Kittanning).

In **Cabell county** this sandstone does not rise above the surface. In Lincoln county it crops along the Guyandot river at the mouth of Falls creek, one mile and a half south of West Hamlin, and makes the falls in the river at that locality. The sandstone gradually rises above the bed of this stream and forms massive cliffs along the river and its tributaries to the southern boundary of Lincoln county.

This sandstone forms massive cliffs along Mud river and its tributaries south of Hamlin and these are 60 to 75 feet high at Myra and Jenks.

This sandstone makes the upper falls of Coal river where it comes to the surface in the bed of that stream and rises to the south until at MacCorkle near the mouth of Cobbs creek its base is 60 to 75 feet above the level of the river.

In **Wayne county** this sandstone comes to the surface at Kenova and near there dips under Big Sandy river and Twelvepole into the Parkersburg Syncline and comes again to the surface out of Twelvepole south of Wayne Court House.

At East Lynn on the East fork of Twelvepole, this sandstone forms massive cliffs from 40 to 60 feet high. It is quarried at several localities near East Lynn and makes an excellent building stone. It forms massive cliffs south of East Lynn in the hills along East fork of Twelvepole until the southern boundary line of Wayne county. This sandstone rises gradually out of West fork of Twelvepole south of Echo and forms ledges in the hills to the southern boundary of the Wayne-Mingo line from 60 to 100 feet thick.

This sandstone comes out of the bed of Big Sandy river at Hubbardstown and forms cliffs along that river and Tug fork and their tributaries, rising gradually to the southern part of the county where it occurs near the tops of the hills.

Middle and Lower Kittanning Coal (No. 5 Block).

Underlying the East Lynn sandstone and frequently separated from it by 2 to 5 feet of slate, there occurs the most persistent coal bed of the whole Allegheny series. In the Kanawha coal field it is mined extensively and is called the **No. 5 Block coal**. This bed appears to be almost universally present at its proper geologic horizon, and nearly always in thickness of commercial value. It has been known under different names in different portions of the State.

This bed appears to be identical with the Lower Kittanning of the Pennsylvania column, or possibly with the Lower and Middle Kittanning combined, since the bed is

generally a multiple one, being separated into two or more benches by partings of slate and bone.

Dr. I. C. White gives the following description in Volume II(A), page 495, West Virginia Geological Survey:

"This coal has three distinct types. First, that in the north Potomac basin, where along with all the other coals of the highly folded eastern region, it has suffered the loss of much volatile matter and has been transformed by incipient metamorphism into a semi-bituminous coal, and hence the analyses of samples of this coal from the north Potomac region are set off by themselves in Table No. 9, page 528.

"Second, the ordinary bituminous type of coal found west from the Allegheny Mountains as exhibited in the mines of Randolph and Barbour counties, the analyses of which are also grouped separately in Table No. 9.

"Third, the Kanawha or 'block' type of this coal found through the southwestern half of the State, where 'splinty' layers begin to invade the bed, and it is no longer of the soft or typical coking type as in the Potomac and Tygart Valley regions, but much harder and higher in volatile matter."

In the Cabell-Wayne-Lincoln area the No. 5 Block coal is possibly the most persistent seam in the area and the most valuable from an economic standpoint. This seam is opened in a great many places in the area and is mined by the East Lynn Coal Company at East Lynn, Wayne county.

The openings will now be taken up in detail and the sections and measurements given in the different districts of the three counties.

In Cabell county the No. 5 Block coal is not exposed above the surface at any point and from the records of the different oil wells it is evident that this coal is of little commercial value in Cabell.

In Lincoln county, No. 5 Block coal crops at the surface of more than half the county and gradually rises until at the southern boundary the coal is from 500 to 550 feet above the floor of the valleys.

The sections of the various openings in this coal will be taken up by magisterial districts.

THE NO 5 BLOCK COAL IN WASHINGTON DISTRICT.

The No. 5 Block coal crops out in Washington district on Cobbs creek west of MacCorkle, and on the head of Peter Cave fork of Horse creek.

Opening No. 94 is located on the south side of Cobbs creek, N 71° W, one mile and a quarter from MacCorkle, about 1000 feet east of Wolf Pit fork on the property of the Seaboard Fuel Company and is mined by Messrs. Arnold et al for local use, where the following section was measured:

Section of Arnold Coal Opening.

		Ft.	In.
Sandstone roof.....			
Slate		0	2
Coal, soft.....	0' 4"	}	3 11
Coal, interlaminated with slate	0 6		
Slate	0 ¾		
Coal	0 ¼		
Slate	1 0		
Coal, hard.....	0 2		
Fire clay and slate.....	0 10		
Coal, very hard, visible, 665' A. T. B.....	1 0	}	

Opening No. 95 is located along Cobbs creek on the property of the Seaboard Fuel Company N 70° W, one mile from MacCorkle, at which the coal was mined by the Mohler Lumber Company for railroad fuel, and the following section was measured:

Section of Mohler Lumber Company's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Slate		0	10
Coal and slate interlamin- ated	0' 6"	}	2 7
Slate, ¾" to 1".....	0 1		
Coal, hard, block, 675' A. T. B.....	2 0		

The basal member in the above section shows a bright, shining coal and mines out in large blocks.

Opening No. 96 is located on the property of the Seaboard Fuel Company on Ely fork of Cobbs creek, S 84° W, one mile and a half from MacCorkle, where the coal is mined by Elin Wilson as fuel for a traction locomotive used by the Mohler Lumber Company. The opening has been driven in about 300 feet from the outcrop where the following section was measured:

Section of Elin Wilson's Coal Opening.

	Ft.	In.
(1) Sandstone, massive.....	40	0
(2) Slate	0	10
(3) Coal, hard, block....1' 7"	4	2
(4) Slate and coal.....0 2		
(5) Coal, hard, block....1 5		
(6) Coal and slate.....0 4		
(7) Coal, soft, gas, 760'		
A. T. B.....0 8		

In the above measurements the similarity of this section to the same coal mined by the East Lynn Coal Company at East Lynn, Wayne county, nearly 30 miles west of this opening, is remarkable. A sample of coal for analysis was taken from Nos. 3, 5 and 7.

Opening No. 97 is located on the property of the Seaboard Fuel Company on Ely fork of Cobbs creek, S 82½° W, one mile and three-quarters from MacCorkle, where the following measurement was taken:

Section of Seaboard Fuel Company's Coal Opening.

	Ft.	In.
Sandstone, massive.....	50	0
Coal, hard, block.....1' 0"	3	0
Slate		
Coal		
Slate		
Coal, hard, block.....1 9		
Slate bottom, 760' A. T. B.....		

It is possible that the "gas coal" is present beneath the slate floor in the above opening.

Opening No. 97(a) is located on the land of J. C. Meadow along Sulphur Spring branch of Horse creek, near Woodville, where the coal is mined for local use, and the following section was measured:

Section of J. C. Meadow's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, soft.....	1' 0"	5	2
Coal, hard.....	2 0		
Slate	0 5		
Coal	0 6		
Slate	0 3		
Coal, hard.....	1 0		
Slate floor.....			

Opening No. 98 is located on the property of the Seaboard Fuel Company south $\frac{1}{4}$ mile from MacCorkle, where the coal was once mined. The opening is now abandoned; elevation, 710' A. T. B.

Opening No. 99 is located on the property of the Seaboard Fuel Company S 25° W, one mile and a quarter from MacCorkle, where the coal was once mined. The opening is now abandoned; elevation, 715' A. T. B.

NO. 5 BLOCK COAL IN DUVAL DISTRICT.

Opening No. 100 is located on the property of N. T. Turley on Laurel fork of Horse creek, where the coal is mined for local use, and the following section was measured:

Section of N. T. Turley's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, hard, block.....	2' to	3	0
Sandstone floor, 805' A. T. B.....			

The usual parting in the coal appears to have disappeared at this opening.

Opening No. 101 is located on the property of N. T. Turley on Laurel fork of Horse creek, N 3° W, one mile and a

half from Woodville, where the coal is mined for local use, and exhibits the following section:

Section of N. T. Turley's Coal Opening.

		Ft.	In.
Sandstone, massive, roof.....			
Coal	1' 6"	2	7
Slate	0 5		
Coal, 820' A. T. B.....	0 8		
Sandstone			

Opening No. 102 is located along Peter Cave fork of Horse creek on the property of R. W. Ryan where the coal is mined for local use, and exhibits the following section:

Section of R. W. Ryan's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, cannel.....	1' 0"	3	0
Coal, medium hard.....	1 3		
Slate and fire clay.....	0 3		
Coal, hard.....	0 6		
Fire clay bottom, 830' A. T.....			

The top portion of this coal in cannel. This is characteristic of the seam in the area under discussion, as will be shown in the sections to be given on subsequent pages.

Opening No. 103 is located on the property of the Horse Creek Land & Mining Company along Big branch of Peter Cave, N 70° W, 2 miles from Woodville, where the coal has been mined, and exhibits the following section:

Section of Horse Creek Land & Mining Company's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Slate			20
Coal, hard, bony.....		2	0
Sandstone		2	0
Slate and fire clay.....		2	0
Sandstone			

Opening No. 104 is located on the property of the Horse Creek Land & Mining Company on Sulphur Spring branch

of Peter Cave fork, N 70° W, 3 miles from Woodville. The following section was measured:

Section of Horse Creek Land & Mining Company's Coal Opening.

			Ft.	In.
Sandstone, coarse, massive.....				
Coal, soft.....	0'	2"	4	5¼
Slate	0	¼		
Coal, gas.....	0	3		
Slate	0	½		
Coal, medium hard.....	0	8		
Slate	0	½		
Coal, hard.....	2	0		
Slate	0	3		
Coal, hard, visible, 855' A. T. B.....	1	0		

NO. 5 BLOCK COAL IN UNION DISTRICT.

Opening No. 105 is located on the property of John Smith along Laurel fork of Mud river, S 5° E, 5 miles from Hamlin near Jenks P. O., where the coal is mined for local use, and exhibits the following:

Section of John Smith's Coal Opening.

			Ft.	In.
(1) Sandstone, massive.....				
(2) Coal, semi-cannel.....	1'	6"	4	0
(3) Slate	0	2		
(4) Coal, block, some bone.....	2	4		
(5) Slate bottom, 690' A. T. B.....				
Butts N 41° W; faces N 49° E.				

Sample for analysis taken from Nos. 2 and 4. There is usually about 7,000 bushels of coal mined here annually for local use.

Opening No. 106 is located on the property of Hiram Scites along Mud river, N 75° E, 4¼ miles from Midkiff, near Jenks P. O., where the coal is mined for local fuel use, as follows:

Section of Hiram Scites' Coal Opening.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Coal, hard, block....3' 2"	5	6
(3)	Coal, bony.....0 6		
(4)	Coal, semi-cannel....1 10		
(5)	Slate floor, 690' A. T. B.....		
Butts, N 40° W; faces N 50° E; elevation, 690' A. T. Aneroid.			

Sample taken for analysis from Nos. 2 and 4.

There is usually about 6,000 bushels mined here annually for local use.

Opening No. 107 is located on the property of Mordecai Adkins, along Mud river, N 88° E, 6 miles from Midkiff, where the coal is mined for local use, and the following section was measured:

Section of Mordecai Adkins' Coal Opening.

		Ft.	In.
(1)	Slate and shale roof.....		
(2)	Coal, medium hard..1' 4"	4	6
(3)	Bone and slate....0 6		
(4)	Coal, splint.....0 10		
(5)	Slate .....0 2		
(6)	Coal, block.....1 8		
(7)	Slate floor, 700' A. T. B.....		
Butts, N 41° W; faces N 49° E.			

Sample taken for analysis from Nos. 2, 4 and 6

Opening No. 108 is located on the lands of Caleb Adkins along Mud river, S 48½° W, 6 miles from Griffithsville, where the coal is mined for local use, and the following section was measured:

Section of Caleb Adkins' Coal Opening.

		Ft.	In.
	Sandstone roof.....		
	Coal, bony.....0' 6"	3	2
	Slate .....0 6		
	Coal, medium hard.....0 7		
	Slate .....0 1		
	Coal, splint.....1 6		
	Slate floor, 710' A. T. B.....		

There is usually about 1,000 bushels mined here annually.

Opening No. 109 is located on Flat creek, 4 miles west of Woodville, where the following section was measured:

		Ft.	In.
Sandstone roof.....			
Coal	0' 10"	2	10
Slate	0 2		
Coal	0 10		
Coal and slate.....	1 0		
Fire clay, 855' A. T. B.....		1	0

Opening No. 110 is located on the land of R. M. Smith along Lick fork of Big creek, N 67° E, 5¾ miles from Ranger, where the following section was measured:

Section of R. M. Smith's Coal Opening.

		Ft.	In.
(1) Slate and shale roof.....			
(2) Coal, splint.....	1' 2"	3	3
(3) Slate	0 1		
(4) Coal, gas, (visible), 780' A. T. B.....	2 0		

Sample for analysis taken from Nos. 2 and 4. No. 4 appears to be softer than usual and forms an excellent smithing coal.

NO. 5 BLOCK COAL IN JEFFERSON DISTRICT.

Opening No. 111 is located on the property of the Lincoln Land Association along Sycamore creek, S 78° W, 5 miles from Woodville, where the following section was measured:

Lincoln Land Association's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal	0' 8"	3	3½
Slate	0 1½		
Coal	1 0		
Slate	0 1		
Coal	0 10		
Slate	0 1		
Coal, visible, 875' A. T. B.....	0 6		

Opening No. 112 is located on the property of Thos. Dotson along Dogbone branch of Left fork of Mud river, S 57° W, $4\frac{3}{4}$ miles from Woodville, where the following section was measured:

Section of Thos. Dotson's Coal Opening.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Coal and slate.....	1'	3"
(3)	Slate	0	9
(4)	Coal, interlaminated with cannel.....	2	1
(5)	Slate and fire clay...0	7	
(6)	Coal, cannelly, visible, 915' A. T. B.....	1	3
		5	11

The coal in Nos. 4 and 6 has laminations of thin layers of cannel coal, or bituminous slate, but burns freely, making a larger percentage of ash than usual.

Opening No. 113 is located on the property of Frank Adkins along Mud river, S $56\frac{1}{2}^{\circ}$ E, one mile and a half from Spurlockville where it is mined for local use, and the following section was measured:

Section of Frank Adkins' Coal Opening.

		Ft.	In.
	Slate roof.....		
	Coal	2'	0"
	Slate	0	2
	Coal, 900' A. T. B.....	2	0
		4	2

Opening No. 114 is located on the property of A. T. Dotson on Bear branch of Mud river, S 70° E, one mile and three-quarters from Spurlockville, where the coal is mined for local use and the following section was measured:

Section of A. T. Dotson's Coal Opening.

		Ft.	In.
(1)	Slate roof.....		
(2)	Coal .....0' 4"	4	6
(3)	Bone and slate.....0 2		
(4)	Coal and slate mixed .....0 4		
(5)	Slate .....0 2		
(6)	Coal, black.....1 5		
(7)	Coal, bony.....0 3		
(8)	Coal, gas, soft.....0 3		
(9)	Coal, bony.....0 4		
(10)	Coal, gas, soft.....0 4		
(11)	Slate .....0 1		
(12)	Coal, bony.....0 4		
(13)	Coal, good, block....0 6		
(14)	Slate floor, 910' A. T. B.....		

Butts, N 40° W; faces N 50° E.

Sampled for analysis from Nos. 2, 4, 6, 8, 10 and 13.

Opening No. 115 is located on the property of J. R. Clay at Spurlockville, about 150 feet above Mud river, where the coal was once mined for local use. The following section was measured there:

Section of J. R. Clay's Coal Opening.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Shale .....0	0	8
(3)	Coal .....0' 1"	7	0
(4)	Fire clay .....2 0		
(5)	Coal .....0 1		
(6)	Slate .....0 6		
(7)	Coal, bony.....1 2		
(8)	Coal, soft gas.....0 6		
(9)	Coal, block.....2 8		
(10)	Rock floor, 900' A. T. B.....		

Butts, N 40° W; faces N 50° E. Sampled for analysis from Nos. 3, 5, 8 and 9.

Opening No. 116 is located on the property of S. A. Egnor along the Left fork of Mud river, N 71° W, 5 miles from Woodville near Bulger P. O., where the following section was measured:

Section of S. A. Egnor's Coal Opening.

		Ft.	In.
(1)	Slate roof.....		
(2)	Coal, medium hard..1' 9"		
(3)	Slate .....0 ½		
(4)	Coal, block.....0 3		
(5)	Coal, bony.....0 4		
(6)	Coal, gas, soft....0 3		
(7)	Slate .....0 7		
(8)	Coal, soft.....0 4		
(9)	Coal, hard, good....0 9		
(10)	Slate bottom, 855' A. T. B.....		
Butts, N 39° W; faces N 51° E.			

Sample for analysis taken from 2, 4, 6, 8 and 9. There is usually about 2,300 bushels mined annually for domestic fuel at this opening.

Opening No. 117 is located along Mud river, S 38° W, 6 miles from Griffithsville, near Palermo, where the coal was once mined for local use and the following section was measured:

Section of Palermo Coal Opening.

		Ft.	In.
	Sandstone roof.....		
	Fire clay and slate.....	2	0
	Coal, hard.....0' 8"		
	Slate .....0 4		
	Coal, bony.....0 3		
	Coal, hard, visible, 725'	2	5
	A. T. B.....1 4		

Opening No. 118 is located on the property of William Hill along Mud river, N 41° W, 1¾ miles from Spurlockville, where the coal is mined for local use, and the following section was measured:

Section of Wm. Hill's Coal Opening.

		Ft.	In.
(1)	Slate roof.....		
(2)	Coal, hard, splint..1' 4"		
(3)	Slate .....0 1		
(4)	Coal, block.....1 0		
(5)	Slate .....0 ½		
(6)	Coal, block.....0 4		
(7)	Slate .....0 1		
(8)	Coal .....0 2		
(9)	Slate .....0 ½		
(10)	Coal, block.....0 6		
(11)	Sandstone floor, 800' A. T. B.....		
Butts, N 40° W; faces N 50° E.			

Sample for analysis taken from Nos. 2, 4, 6, 8 and 10.

The above section is split by several small slate partings, yet the coal mined here yields an excellent block, and appears to be a first-class fuel coal.

Opening No. 119 is located at the head of Sanger branch of Mud river on the property of Marine Lovejoy where the coal is mined for local use, and the following section was measured:

Section of Marine Lovejoy's Coal Opening.

		Ft.	In.
(1)	Sandstone, massive.....		
(2)	Coal and slate.....0' 2"	2	11
(3)	Coal .....1 0		
(4)	Slate .....0 2		
(5)	Coal .....0 4		
(6)	Slate .....0 1		
(7)	Coal, hard, visible,		
	890' A. T. B.....1 2		

Opening No. 120 is located on the property of Kelly Spurlock along Laurel fork of Mud river, S 73° W, one mile and a quarter from Spurlockville where the coal is mined for local use, and the following section was measured:

Section of Kelly Spurlock's Coal Opening.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Coal bony.....0' 6"	4	3
(3)	Coal, block.....1 5		
(4)	Slate .....0 4		
(5)	Coal, block.....0 6		
(6)	Coal, slate and bone,		
	900' A. T. B.....1 6		
Butts, N 42° W; faces N 48° E.			

Samples for analysis taken from 2, 3 and 5.

There is usually about 500 bushels mined here annually.

Opening No. 121 is located along Mud river, N 47° W, one mile and three-quarters from Spurlockville, where the following section was measured:

			Ft.	In.
Sandstone, massive roof.....				
Coal, slaty.....	0'	10"	6	7
Fire clay and slate.....	3	0		
Coal, slaty.....	0	8		
Slate	0	1		
Coal, block, visible, 805'				
A. T. B.....	2	0		

Opening No. 122 is located on the property of Benton Skeens along Big creek of Mud river, N $82\frac{1}{2}^{\circ}$ W, $2\frac{1}{2}$ miles from Spurlockville where the coal is mined for local use, and the following section was measured:

Section of Benton Skeens' Coal Opening.

			Ft.	In.
(1) Slate roof.....				
(2) Coal, medium hard..	0'	5"	2	5
(3) Slate	0	$\frac{1}{2}$		
(4) Coal, splint.....	0	8		
(5) Slate	0	$\frac{1}{2}$		
(6) Coal, medium hard..	1	3		
(7) Slate floor, 795' A. T. B.....				

Butts, N 40° W; faces 50° E. Sample for analysis taken from Nos. 2, 4 and 6.

Opening No. 123 is located on the property of the Lincoln Land Association near the head of Big creek, S 55° W, $2\frac{3}{4}$ miles from Spurlockville, where the following section was measured:

Section of Lincoln Land Association's Coal Opening.

			Ft.	In.
Sandstone				
Coal, hard, block.....	2'	3"	3	9
Slate pyritous.....	0	3		
Coal, hard, visible, 950'				
A. T. B.....	1	3		

Opening No. 124 is located on the property of Elbert Hager along Upton branch of Laurel fork of Mud river, S 53° W, 1 mile from Spurlockville where the coal is mined for local use, and exhibits the following structure:

Section of Elbert Hager's Coal Opening.

		Ft.	In.
Slate roof			
Coal	0' 1"	6	4
Slate	0 4		
Coal	0 5		
Coal and slate.....	2 0		
Coal, hard.....	2 3		
Slate	0 3		
Coal, hard, block, visible,			
900' A. T. B.....	1 0		

Opening No. 125 is located on the property of Wilburn Hill along the Left fork of Mud river, S 61° W, 4 miles from Woodville, where the coal is mined for local use, and the following section was measured:

Section of Wilburn Hill's Coal Opening.

		Ft.	In.
(1) Shale and slate roof.....			
(2) Coal, gas, soft.....	0' 3"	2	9
(3) Slate	0 3		
(4) Coal, hard, splint....	2 3		
(5) Slate bottom 905' A. T. B.....			
Butts, 40° W; faces N 50° E. Sample for analysis from Nos. 2 and 4.			

Opening No. 126 is located on the property of Calaway Bragg along Parsner creek of Mud river, S 38° W, 5½ miles from Griffithsville, where the following section was measured:

Section of Bragg's Coal Opening.

		Ft.	In.
(1) Sandstone roof			
(2) Slate		2	6
(3) Coal, soft.....	0' 10"	2	2½
(4) Slate	0 1		
(5) Coal, block.....	1 0		
(6) Slate	0 ¼		
(7) Coal, block.....	0 2		
(8) Slate	0 ¼		
(9) Coal, slaty.....	0 4		
(10) Coal, block.....	0 9		
(11) Slate bottom, 725' A. T. B.....			
Butts, N 43° W; faces N 47° E. Sample for analysis taken from Nos. 3, 5, 7, 9 and 10.			

There is usually about 800 bushels of coal mined here annually.

Opening No. 127 is located on the land of D. G. Courtney along Berry branch of Mud river, S 68° E, 4½ miles from Spurlockville, where the following section was measured:

Section of D. G. Courtney's Coal Opening.

		Ft.	In.
(1)	Slate and shale roof.....		
(2)	Coal, block.....0' 2"	4	8
(3)	Coal, bony.....0 2		
(4)	Coal, splint.....0 6		
(5)	Slate .....0 6		
(6)	Coal, hard.....0 4		
(7)	Coal and slate.....0 6		
(8)	Coal .....0 6		
(9)	Coal, bony .....0 4	1	8
(10)	Coal, block.....1 8		
(11)	Slate bottom, 910' A. T. B.....		

Butts, N 40° W; faces, N 50° E. Sample for analysis taken from Nos. 2, 4, 6, 8 and 10.

Opening No. 128 is located on Flat creek, S 86° W, 4¾ miles from Woodville, where the following measurement was taken:

Section of Flat Creek Coal Opening.

		Ft.	In.
(1)	Sandstone		
(2)	Coal .....0' 2"	1	10
(3)	Slate .....0 4		
(4)	Fire clay.....0 6		
(5)	Coal, hard, block...0 10		
(6)	Slate floor, 855' A. T. B.....		

The above section was taken at a prospect opening near the road and it is possible if the opening were driven in further, the thickness of the coal would increase.

Opening No. 129 is located on the property of D. G. Courtney along Laurel branch of Mud river, S 40° W, 5¾ miles from Woodville where the coal is mined for local fuel, and the following section was measured:

Section of D. G. Courtney's Coal Opening.

		Ft.	In.
Sandstone			
Slate		0	4
Coal, block.....0'	5"	8	10
Slaty shale.....3	8		
Coal, slaty.....0	10		
Slate	0		
Fire clay and coal.....0	3		
Coal, splint.....2	2		
Coal, medium hard, visible,			
995' A. T. B.....1	2		

Opening 130 is located on the property of Samuel Stephenson et al on Connelly branch of Mud river, N 40° E, 5¼ miles from Big Creek Station, where the coal is mined for local use, and exhibits the following structure:

Section of Samuel Stephenson's Coal Opening.

		Ft.	In.
Sandstone			
Coal, hard.....0'	4"	4	11¼
Coal, slaty.....0	3		
Coal, hard.....0	5		
Slate and bone.....0	5		
Coal, very hard, block...2	6		
Slate	0		
Coal, medium, hard, visible,			
1100' A. T. B.....1	0		

Opening No. 131 is located on the property of Manley Adkins near the headwaters of Connelly branch of Mud river, N 44° E, 5 miles from Big Creek Station; elevation of coal, 1105' A. T. B. The opening had fallen in and it was not possible to get a section.

Opening No. 132 is located on Hense branch of Big creek, S 64° E, 5¼ miles from Midkiff, where the following measurements were taken:

Hense Branch Coal Opening.

			Ft.	In.
Slate and sandstone.....				
Slate				
Slate and coal.....	1'	0"	5	8
Fire clay.....	0	10		
Coal	0	6		
Slate	0	3		
Coal	0	3		
Slate	0	2		
Coal	1	8		
Slate floor, 835' A. T. B.....				

Opening No. 133 is located on the head of Laurel fork of Big creek, S 87° E, 5 miles from Ranger, where the following section was measured:

Section of Laurel Fork Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal, hard, block.....	1'	6"	3	2
Slate	0	2		
Coal, block, visible, 900'				
A. T. B.....	1	6		

NO. 5 BLOCK COAL IN LAUREL HILL DISTRICT.

Opening No. 134 is located along Nine Mile creek on land of the Lincoln Land Association, S 46½° E, 3¾ miles from Midkiff, where the following section was measured:

Section of Lincoln Land Association's Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal, hard, block.....	1'	6"	2	10
Slate	0	1		
Coal, gas, soft.....	1	3		
Fire clay floor, 820' A. T. B.....				

The top portion of the coal in the above opening comes out in large blocks and appears to be good fuel, while the bottom part is a softer coal.

Opening No. 135 is located on the lands of the Lincoln Land Association near the head of Nine Mile creek, N 84°

E, $4\frac{1}{3}$ miles from Ranger, where the following section was measured:

Section of Lincoln Land Association's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, block.....	1' 10"	2	11
Slate	0 1		
Coal, gas, visible, 890'			
A. T. B.....	1 0		

Opening No. 136 is located on the land of Jesse Hoover on Lick branch of Big creek, S 70° E, 3 miles from Midkiff, where the coal is mined for local use, and the following section was measured:

Section of Jesse Hoover's Coal Opening.

		Ft.	In.
Sandstone			
Slate		8	0
Coal, slate.....	1' 0"	4	7
Fire clay.....	1 0		
Coal	0 11		
Slate	0 2		
Coal, visible, 805' A. T. B.	1 6		

NO. 5 BLOCK COAL IN HARTS CREEK DISTRICT.

Opening No. 137 is located on the land of Sherman Nelson, S $33\frac{1}{2}^{\circ}$ E, 3 miles from Ranger, where the following section was measured:

Section of Sherman Nelson's Coal Opening.

		Ft.	In.
Shaly sandstone roof.....			
Coal some thin slates.....	1' 6"	3	10
Fire clay.....	0 8		
Coal, blocky, visible 980' A. T. B.	1 8		

Opening No. 138 is located on the land of Harrison Noe along the East fork of Fourteen Mile creek, S 14° E, 3 miles from Ranger, where the coal is mined for local fuel use. The following section was measured:

Section of Harrison Noe's Coal Opening.

			Ft.	In.
(1)	Sandstone, massive, roof.....			
(2)	Coal, bony.....0'	4"	5	3
(3)	Coal, semi-cannel..0	5		
(4)	Coal, splint.....2	0		
(5)	Coal and slate....0	4		
(6)	Slate .....0	1½		
(7)	Coal, block.....1	1		
(8)	Slate .....0	½		
(9)	Coal, block.....0	11		
(10)	Slate floor, 960' A. T. B.....			

Butts, N 42° W; faces N 48° E. Sample for analysis taken from Nos. 4, 7 and 9.

Opening No. 139 is located on the land of the Lincoln Land Association, along Laurel fork of Big Ugly creek, N 41° E, 4½ miles from Ferrellsburg, where the coal is mined for local use, and the following section was measured:

Section of Lincoln Land Association's Coal Opening.

			Ft.	In.
(1)	Good slate roof.....			
(2)	Coal, block, hard..0'	2"	5	11½
(3)	Slate .....0	1½		
(4)	Coal, block, hard..1	0		
(5)	Slate .....0	5		
(6)	Coal, hard, splint..0	6		
(7)	Bone coal.....0	1		
(8)	Coal, splint.....0	8		
(9)	Coal, bony.....0	6		
(10)	Coal, splint.....0	10		
(11)	Coal, block.....1	8		
(12)	Slate bottom, 860' A. T. B.....			

Butts, N 33° W; faces N 57° E. Sample for analysis taken from Nos. 2, 4, 6, 8, 10 and 11.

Opening No. 140 is located on the land of the McKinsey Coal Company along Guyandot river, S 67° E, ⅓ mile from Ferrellsburg, where the coal has been mined for local use, and the following section was measured:

Section of McKinsey's Coal Opening.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Coal, medium hard...0' 8"	7	0
(3)	Slate .....0 4		
(4)	Coal, block.....1 8		
(5)	Fire clay and shale..2 5		
(6)	Coal, bony.....0 5		
(7)	Coal, good, block...1 6		
(8)	Fire clay floor, 925' A. T. B.....		

Butts, N 18°W; faces N 72° E. Sample for analysis taken from Nos: 4 and 7.

The above opening shows total coal of 4' 10" with a heavy parting of fire clay and slate of 2' 5" near the middle.

Opening No. 141 is located on the land of the Guyandotte Land Association on Kiah creek at mouth of Frances branch, where the coal is mined for local use, and the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
	Sandstone with iron ore nodules.....		
	Coal, hard.....0' 9"	6	4
	Slate .....0 1		
	Coal, block.....1 3		
	Slate .....0 1		
	Coal, hard, block.....1 10		
	Fire clay.....0 5		
	Coal, hard.....0 8		
	Fire clay and sandstone mixed .....0 3		
	Coal, hard, block.....1 0		
	Slate floor, 1035' A. T. B.....		

The above section shows 5' 6" of coal with four partings, and the coal appears to be of excellent quality, coming out in large blocks.

Opening No. 142 is located on the land of R. W. Walker along Guyandot river, S 72° W, ½ mile from Ferrellsburg, where the coal is mined for local use, and the following section was measured:

Section of R. W. Walker's Coal Opening.

	Ft.	In.
Sandstone		
Coal, slaty.....0' 9"	4	10
Slate		
Coal, block, hard.....1 4		
Slate		
Coal, block.....0 2		
Fire clay.....0 5		
Coal, hard, splint, 925'		
A. T. B.....1 8		

Opening No. 143 is located on the land of A. F. Lucas along Abbott branch of Big Ugly creek, N 63° E, 2½ miles from Ferrellsburg, where the following section was measured:

Section of A. F. Lucas' Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, block, or semi-	5	0
cannel .....1' 0"		
Coal, laminated .....1 0		
Slate and fire clay with		
streaks of coal.....3 0		
Sandstone bottom, 920' A. T. B.....		

Opening No. 143(a).—Tenants are mining the No. 5 Block coal on the Guyandotte Land Association's property on Kiah creek just above the mouth of Copley branch, Harts Creek district, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, hard .....1' 6"	6	6
Slate		
Coal, block, 1135' A. T. B.4 11		

Opening No. 143(b).—Belle Johnson is mining the No. 5 Block coal on Kiah creek, just above the mouth of Jim branch, Harts Creek district, where the following section was measured:

Section of Belle Johnson's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Shale with coal streaks.....		1	3
Coal, soft.....2' 1"	}	6	0
Coal, hard.....3 9			
Coal (reported), 1165'			
A. T. B.....1 2	}		

Opening No. 143(c).—Lewis Maynard has a mine in the No. 5 Block coal on the head of Ivy Trace branch of Harts creek, and there the following section was measured:

Section of Lewis Maynard's Coal Opening.

		Ft.	In.
Slate roof.....			
Coal, interlaminated	}	6	7
with slate.....1' 6"			
Coal, hard, block, 1225'			
A. T. B.....5 1	}		

In Wayne county the **No. 5 Block coal** rises above the beds of the streams, in the southern half of the county. It rises out of East fork of Twelvepole about two miles northwest of East Lynn and gradually rises to the southeast. At East Lynn it is from 30 to 40 feet above the bed of the creek. The coal rises out of West fork of Twelvepole just north of Genoa and gradually gets higher in the hills to the southeast until at the Wayne-Mingo line it is from 350 to 375 feet above the floor of the valley. No. 5 Block coal comes out of Big Sandy river just north of Ft. Gay and rises gradually in the hills to the southeast until at Kermit it occurs from 550 to 600 feet above the floor of the Tug valley.

NO. 5 BLOCK COAL IN STONEWALL DISTRICT.

Opening No. 144 is located on the land of Peter Clark along Brushy creek of East fork of Twelvepole, S 10° W, 3 miles from East Lynn where the coal is mined for local use, and the following section was measured:

Section of Peter Clark's Coal Opening.

	Ft.	In.
Sandstone		
Sandstone with coal parting.....		
Coal, hard, splint.....1' 4" }		
Slate .....0 1 }	2	9
Coal, 675' A. T. B.....1 4 }		

The coal mines in large lumps and has a rich, glossy appearance.

Opening No. 144(a) is located on the land of Nathan McClellan along Brushy creek of East fork of Twelvepole, S 13° W, 3 miles from East Lynn, where the following section was measured:

Section of Nathan McClellan's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Sandstone and coal mixed.....	0	8
Coal, medium hard.....	2	11
Slate floor, 675' A. T. B.....		

The coal is mined here for local fuel use.

Opening No. 145 is located on the land of Noble Watts near the head of Brushy creek of East fork of Twelvepole where the coal is mined for local use, and the following section was measured:

Section of Noble Watts' Coal Opening.

	Ft.	In.
Sandstone		
Coal, gas.....0' 4" }		
Coal, impure... ..0 4 }		
Coal, hard, block.....1 4 }	3	2
Slate .....0 2 }		
Coal, hard, block.....1 0 }		
Slate floor, 820' A. T. B.....		

Opening No. 146 is located on the property of the Guyandotte Land Association along Right fork of Camp creek, one mile east of East Lynn, where the coal is mined for local fuel by William Peary, and the following section was measured:

Section of William Peary's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, hard, splint.....2' 3"	}	5	11
Slate .....0 1			
Coal, hard, splint.....2 0			
Bone .....5" to 0 8			
Coal, soft, 670' A. T. B....1 1			

This coal has a good roof and the basal portion is excellent for smithing purposes.

Opening No. 147 is located on the land of Wm. Napier along Little Lynn creek, N 28° E, 1 mile from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of Wm. Napier's Coal Opening.

		Ft.	In.		
Sandstone					
Slate		0	2		
Coal, hard.....1' 6"	}	4	2		
Slate .....0 1					
Coal, hard.....1 6					
Bone .....0 4					
Coal, soft.....0 9					
Fire clay, 650' A. T. B.....					
Butts, N 40° W; faces N 50° E.					

Opening No. 148 is located on the land of Walter Osborne along East fork of Twelvepole, south 1/2 mile from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of Walter Osborne's Coal Opening.

		Ft.	In.
Sandstone, heavy, massive.....	50' to	60	0
Coal, hard, block.....	2' 2"	5	6
Slate	0 1		
Coal, hard.....	1 8		
Bone, coal.....	8" to 12		
Coal, soft, gas.....	0 9		
Fire clay floor, 660' A. T. B.....			

Opening No. 149 is located on the land of Walter Osborne along Old House branch of Camp creek, S 31° E, $\frac{3}{4}$ mile from East Lynn where the following section was measured:

Section of Walter Osborne's Coal Opening.

		Ft.	In.
Sandstone, massive.....	40' to	50	0
Coal, hard, block.....	2' 2"	5	4
Slate	0 1		
Coal, hard, block.....	1 6		
Bone coal.....	8" to 10		
Coal, gas, soft, 680' A. T. B... 10	10		

The above opening shows 3' 8" of good block coal, and the bottom layer is a good smithing coal.

Opening No. 150 is located near East Lynn at a mine operated by the East Lynn Coal Company, where the following measurement was taken:

Section of East Lynn Coal Company's Coal Opening.

		Ft.	In.
(1) Sandstone roof.....			
(2) Coal, hard, block...1'	6"	4	1½
(3) Slate	0 0½		
(4) Coal, medium hard.1	7		
(5) Coal, bone.....	0 8		
(6) Coal, medium hard.0	4		
(7) Fire clay bottom, 647' A. T. L.....			

Butts, N 39° 30' E; faces, 50° 30' W. Sample for analysis taken from Nos. 2, 4 and 6.

The above Company has recently made a new opening and constructed new side tracks and tipple and are now mining the coal with electric machines. They employ about 100 men. Captain Wm. Perry is general manager for the company.

Opening No. 151 is located on the property of the Guyandotte Land Association on the Left fork of Camp creek, $2\frac{3}{4}$ miles from East Lynn, where the coal is mined for local fuel, and the following measurement was taken:

Section of Guyandotte Land Association's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Fire clay.....	0	5
Coal and slate.....0' 7"	3	6
Fire clay.....0 1		
Coal .....0 3		
Fire clay.....0 5		
Coal, medium, hard.....2 2		
Sandstone bottom, 700' A. T. B.....		

Opening No. 152 is located on the land of Harkins Likens along the East fork of Twelvepole, S 23° W, 2 miles from East Lynn, where the following section was measured:

Section of Harkins Likens' Coal Opening.

	Ft.	In.
Sandstone, massive.....		
Slate and coal.....0' 10"	3	11
Fire clay and slate.....0 5		
Coal, impure .....0 4		
Coal, hard, block.....1 6		
Slate .....0 2		
Coal, hard, bony, visible, 685' A. T. B.....0 8		

Opening No. 153 is located along the Lick fork of East fork of Twelvepole, S 33½° E, 3½ miles from East Lynn, where the following section was measured:

Section of Lick Fork Coal Opening.

	Ft.	In.
Sandstone, massive, roof.....		
Coal, impure.....0' 10"	6	3
Fire clay.....0 8		
Coal, hard, block... ..1 6		
Slate .....0 0½		
Coal, hard, block... ..1 0		
Slate .....0 1½		
Coal, hard, block... ..0 6		
Coal, bony.....1 7		
Slate floor, 810' A. T. B.....		

Opening No. 153(a) is located on the land of John Fry along a branch of East fork of Twelvepole, S 12½° E, 3

miles from East Lynn, where the coal is mined for local use and the following section was measured:

Section of John Fry's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Slate		0	11
Coal, block.....3' 0"	}	4	5
Slate and fire clay dark..0 3			
Coal, hard, visible, 785'			
A. T. B.....1 2			

Opening No. 154 is located on the land of Perlina Napier along the Lick fork of East fork of Twelvepole, S $34\frac{1}{2}^{\circ}$ E, $4\frac{1}{4}$ miles from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of Perlina Napier's Coal Opening.

		Ft.	In.
Sandstone, massive, roof.....			
Slate .....0' 8"	}	5	2
Coal, block.....0 2			
Slate .....0 0½			
Coal, block.....0 3			
Fire clay.....0 8			
Slate .....0 3			
Coal, block.....1 0			
Slate .....0 1			
Coal, block.....1 1			
Slate .....0 2½			
Coal, block.....0 3			
Coal, bony, visible, 815'			
A. T. B.....0 6			

Opening No. 155 is located on the land of Alvis Perry along the Right fork of Camp creek, one mile and a third east from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of Alvis Perry's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, block.....1' 6"	}	3	5
Slate .....0 1			
Coal, hard.....1 5			
Coal, bony, visible, 695'			
A. T. B.....0 6			

Opening No. 156 is located on the land of William Porter, Big Lynn creek, S 40° W, $2\frac{1}{4}$ miles from East Lynn, where the coal has been mined for local use and exhibits the following structure:

Section of William Porter's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal and slate.....	2	0
Fire clay, 670' A. T. B.....	1	0
Fire clay and slate, contorted.....		-

The above section is given to illustrate how the No. 5 Block coal is sometimes contorted and mixed with slate and fire clay.

Opening No. 157 is located on the land of D. P. Porter along Big Lynn creek, S 42° W, $2\frac{1}{2}$ miles from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of D. P. Porter's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, hard.....1' 6" }		
Slate .....0 1 }		
Coal .....0 11 }	5	0
Fire clay.....1 0 }		
Coal, splint (some bone 655' A. T. B.....1 6 }		

Opening No. 158 is located on the property of William Osborne along the Left fork of Camp creek, S 65° E, one mile and a half from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of William Osborne's Coal Opening.

	Ft.	In.
Sandstone, massive.....		
Slate and coal.....0' 3" }		
Fire clay or slate.....1 0 }		
Coal, impure.....0 $3\frac{1}{4}$ }	4	5
Coal, block, hard.....1 8 }		
Slate .....0 $\frac{3}{4}$ }		
Coal, impure.....1 2 }		
Fire clay bottom, 685' A. T. B.....		

Opening No. 159 is located along the East fork of Twelvepole, on the east side of same just opposite East Lynn, where the coal has been faced up, but shows a section very much split up with slate and fire clay, as follows:

Section of East Lynn Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal, block.....	1'	1"		
Slate and fire clay.....	0	1		
Coal	0	2½		
Slate or fire clay.....	0	1		
Coal	0	3		
Slate or fire clay.....	0	1½	2	9
Coal	0	5		
Slate or fire clay.....	0	¼		
Coal	0	2		
Slate or fire clay.....	0	¾		
Coal, visible 680' A. T. B.	0	3		

Opening No. 160 is located along Laurel creek of the East fork of Twelvepole, S 51° E, 2¾ miles from East Lynn, where the coal has been partially exposed, and the following section was measured:

Section of Laurel Creek Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal	1'	4"		
Slate	0	10		
Coal	1	4	4	6
Coal and slate, visible, 750' A. T. B.	1	0		

The opening was not fully faced up, and it is possible that the thickness of the coal might be greater when it is fully opened.

Opening No. 161 is located on the land of Mrs. Julia Napier along the East fork of Twelvepole, S 40° W, one-half mile from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of Julia Napier's Coal Opening.

			Ft.	In.
Sandstone roof.....				
Coal, hard, block.....	2'	4"		
Slate	0	1		
Coal, hard.....	1	6		
Bony coal.....	8"	to 12		
Coal, soft, gas.....	0	9		
Fire clay floor, 655' A. T. B.....			5	6

NO. 5 BLOCK COAL IN GRANT DISTRICT.

Opening No. 162 is located on the land of Joseph Pack along Little Laurel of Kiah creek, S 53° W, 5½ miles from Ranger, where the coal is mined for local use, and the following section was taken:

Section of Josephine Pack's Coal Opening.

			Ft.	In.
(1) Sandstone roof.....				
(2) Slate, hard, black..	0'	2"		
(3) Coal, very hard....	0	2		
(4) Slate	0	1		
(5) Coal, very hard, impure	0	10		
(6) Slate	0	2		
(7) Coal, gas.....	0	6		
(8) Slate	0	3		
(9) Coal, block.....	1	3		
(10) Slate	0	1		
(11) Coal, block.....	1	0		
(12) Slate bottom, 850' A. T. B.....			4	6

Sample for analysis taken from Nos. 3, 5, 7, 9 and 11.

Opening No. 163 is located on the property of the Guyandotte Land Association along the Left fork of Rich creek, N 54° E, 4½ miles from Dunlow, where the coal is mined for local use, and the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

			Ft.	In.
(1) Sandstone roof.....				
(2) Coal, medium, hard..	1'	4"		
(3) Fire clay.....	0	4½		
(4) Coal, splint.....	1	0		
(5) Coal, bone.....	0	8		
(6) Coal	1	1		
(7) Fire clay bottom, 933' A. T. B.....			4	5½

Butts, N 40° W; faces N 50° E. Sample for analysis taken from Nos. 2, 4, 5 and 6.

Opening No. 164 is located on the property of the Guyandotte Land Association on a branch of East fork of Twelvepole, S 40° W, 7½ miles from Ranger, where the coal is mined for local use, and the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

	Ft.	In.
Sandstone, massive, contorted.....		
Slate	0	3
Coal .....0' 2" }		
Slate .....0 ½ }		
Coal .....0 8 }		
Slate .....0 4 }	3	5½
Coal, impure.....0 10 }		
Slate .....0 2 }		
Coal, block, 890' A. T. B..1 0 }		

Opening No. 165 is located on the land of John Smith along Rich creek, S 16½° E, 5¼ miles from East Lynn, where the coal is mined for local use, and the following section was measured:

Section of John Smith's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, medium hard.....0' 9" }		
Slate, black.....0 2 }		
Coal, splint.....1 4 }	5	4
Slate or fire clay.....1 0 }		
Coal, bony.....0 7 }		
Coal, block.....1 6 }		
Fire clay bottom, 825' A. T. B.....		

Opening No. 166 is located on the land of Asa F. Queen, Kiah creek, S 36° W, 7½ miles from Ranger near Queen Ridge P. O., where the coal is mined for local use, and the following section was measured:

Section of Asa F. Queen's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, gas.....0 4" }		
Coal, hard, block.....1 6 }		
Slate .....0 1 }	5	5
Coal, hard, block.....2 0 }		
Fire clay.....0 5 }		
Coal, hard, block.....1 1 }		
Fire clay.....	0	10

Opening No. 167 is located on the land of the Guyandotte Land Association at the head of Rollem fork of Kiah creek. S 13° W, $6\frac{3}{4}$ miles from Ranger, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

			Ft.	In.
Shale roof.....				
Coal and slate.....	0' 10"	}		
Fire clay.....	0 9			
Coal, impure.....	1 0			
Coal and slate.....	0 8			
Slate	0 2			
Coal, medium hard.....	1 0		6	6
Fire clay.....	0 5			
Coal, medium hard.....	0 8			
Coal, hard, splint, (visible), 940' A. T. B.....	1 0	}		

Opening No. 168 is located on Laurel fork of Kiah creek. S 25° W, $4\frac{1}{2}$ miles from Ranger, where the coal is mined for local fuel use, and exhibits the following section:

Section of Laurel Creek Coal Opening.

			Ft.	In.
Sandstone, massive.....				
Shale, with iron ore nodules.....			3	0
Sandstone, hard.....			0	1
Shale, with iron ore nodules.....			3	0
Slate			0	4
Coal, impure.....	1' 10"	}		
Slate	0 2			
Coal, hard, splint, 860'			2	6
A. T. B.....	1 6			

Opening No. 169 is located on the land of Elizabeth Caldwell, Kiah creek, S 41° W, 6 miles from Ranger, where the coal is mined for local use, and the following section was measured:

Section of Elizabeth Caldwell's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Bone coal.....	0' 6"		
Coal, hard, block.....	2 2		
Slate	0 2		
Coal, hard, block.....	0 6		
Fire clay.....	1 2		
Coal	0 3		
Slate bottom, 850' A. T. B.....		5	9

Opening No. 170 is located on the land of Dee Pack along a branch of Big Laurel of Kiah creek, S $37\frac{1}{2}^{\circ}$ W, $4\frac{1}{2}$ miles from Ranger, where the coal is mined for local use, and the following section was measured:

Section of Dee Pack's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, block, cannely.....	1' 0"		
Coal, gas.....	1 0		
Slate	0 3		
Coal	0 6		
Slate	0 2		
Coal and slate.....	0 4		
Slate	0 2		
Coal, block.....	1 10		
Slate bottom, 875' A. T. B.....		5	3

Opening No. 171 is located near the head of Beechy branch of East fork of Twelvepole, N 51° E, $5\frac{1}{8}$ miles from Dunlow, where the following section was measured:

Section of Beechy Branch Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, impure.....	1' 0"		
Fire clay.....	0 3		
Coal, splint.....	1 5		
Slate	0 1		
Coal, bony splint.....	1 6		
Fire clay bottom, 940' A. T. B.....		4	3

Opening No. 172 is located near the head of Left fork of Big Laurel of Kiah creek, S $37\frac{1}{2}^{\circ}$ W, $4\frac{1}{2}$ miles from Ranger, where the following section was measured:

Section of Big Laurel Creek Coal Opening.

		Ft.	In.
Shale roof.....			
Coal, impure.....	1' 4"		
Slate	0 1		
Coal, hard block.....	1 3		
Slate	0 4		
Coal, soft.....	0 6		
Slate	0 3		
Coal, block.....	1 0		
Fire clay floor, 865' A. T. B.....		4	9

Opening No. 173 is located on the land of the Guyandotte Land Association on Devil Trace branch of East fork of Twelvepole, S $36\frac{1}{2}^{\circ}$ W, $8\frac{1}{2}$ miles from Ranger, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal and slate.....	0' 3"		
Slate	0 6		
Coal, good.....	0 8		
Slate	0 1		
Coal, block.....	1 0		
Fire clay.....	0 6		
Coal, block, visible, 915'		3	8
A. T. A.....	0 8		

Opening No. 174 is located on the land of Lucian Wiley along Cove creek, S 63° W, $5\frac{1}{4}$ miles from Wayne, where the coal is mined for local use, and the following section was measured:

Section of Lucian Wiley's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal and slate.....	2' 0"		
Cannel coal.....	2 6		
Slate, 815' A. T. B.....		4	6

Opening No. 175 is located on the land of Milton Perry along a branch of Little Milam creek, N 84° E, $6\frac{1}{4}$ miles from Dunlow, where the following section was measured:

Section of Milton Perry's Coal Opening.

		Ft.	In.
Slate		2	"
Coal, gas, soft.....	2' 6"	3	8
Slate	0 2		
Coal, hard, 900' A. T. B....	1 0		

Opening No. 176 is located on the land of John Tomblin along Trough creek, S 25° W, 6 miles from Ranger, where the coal is mined for local fuel, and the following section was measured:

Section of John Tomblin's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, impure.....	1' 0"	4	10
Slate	0 6		
Coal, hard, block.....	1 0		
Slate	0 4		
Coal, block, 857' A. T. L....	2 0		

NO. 5 BLOCK COAL IN LINCOLN DISTRICT.

Opening No. 177 is located on the land of S. J. Ferguson along the waters of West fork of Twelvepole, S 10½° E, 1 mile from Ferguson, where the following section was measured:

Section of S. J. Ferguson's Coal Opening.

		Ft.	In.
Sandstone			
Slate		0	2
Coal	0' 2"	3	6
Slate and coal.....	0 4		
Coal, block.....	1 8		
Slate	0 4		
Coal, visible, 820' A. T. A	1 0		

Opening No. 178 is located on the land of S. J. Ferguson along Big branch of West fork of Twelvepole, S 40° W, one mile and a half from Ferguson, where the following section was measured:

Section of S. J. Ferguson's Coal Opening.

		Ft.	In.
(1)	Sandstone, massive.....		
(2)	Slate and fire clay.....	5	0
(3)	Slate	1	3
(4)	Coal, gas.....1' 1" }		
(5)	Coal, hard, bony....1 0 }	2	11
(6)	Coal, good.....0 10 }		
(7)	Fire clay bottom, 820' A. T. B.....		

Sample for analysis taken from Nos. 4 and 6.

Opening No. 179 is located on the land of S. J. Ferguson along the West fork of Twelvepole, $\frac{1}{4}$ mile west from Ferguson, where the following section was measured:

Section of S. J. Ferguson's Coal Opening.

		Ft.	In.
(1)	Sandstone, massive.....		
(2)	Coal, gray splint...1' 9" }		
(3)	Coal, gas, medium hard .....2 4 }		
(4)	Fire clay.....0 1 }	6	10½
(5)	Coal, block.....0 5 }		
(6)	Coal, impure.... 0 6 }		
(7)	Fire clay.....0 1½ }		
(8)	Coal, soft, visible..1 8 }		

Sample for analysis taken from Nos. 2, 3 and 5; elevation 825' A. T. B.

Opening No. 180 is located on the land of S. J. Ferguson along Ferguson branch about one mile and a quarter from its mouth, where the coal is mined for local use, and the following section was measured:

Section of S. J. Ferguson's Coal Opening.

		Ft.	In.
	Sandstone roof.....		
	Coal, block.....1' 5" }		
	Coal, gas.....0 8 }		
	Coal, block.....0 8 }	4	7
	Coal and slate.....0 9 }		
	Coal, hard, block.....1 1 }		
	Fire clay floor, 850' A. T. B.....		

Opening No. 181 is located on the land of John Williams along Spruce fork of West fork of Twelvepole, 88° W, one mile and a half from Wilsondale, where the coal is mined for local fuel, and the following section was measured:

Section of John Williams' Coal Opening.

		Ft.	In.
Sandstone			
Slate		0	1
Coal, hard, splint.....1' 6"	}	3	2
Slate			
Coal, bony.....0 1½			
Coal, block.....0 5½			
Coal, block.....1 1	}		
Fire clay bottom, 1060' A. T. B.....			

Opening No. 182 is located on the land of Morgan Stepp along a branch of Moses creek, N 46° E, 4 miles from Crum, where the coal is mined for local use, and the following section was measured:

Section of Morgan Stepp's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, impure.....0' 6"	}	4	5
Slate			
Coal, block.....2 0			
Slate			
Coal, bony.....0 2	}		
Coal, block.....0 8			
Coal, block.....1 0	}		
Fire clay floor, 1100' A. T. B.....			

Opening No. 183 is located on the land of J. D. Caldwell along the Right fork of Bull creek, N 48° W, 3½ miles from Crumm, where the coal is mined by Bell Marcum, and the following section was measured:

Section of Bell Marcum's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, impure.....0' 5"	}	4	6
Slate			
Coal, block.....2 1			
Slate			
Coal, bony.....0 2	}		
Coal, block.....0 8			
Coal, block.....1 0	}		
Fire clay bottom, 1090' A. T. B.....			

Opening No. 184 is located on the property of the Glenhayes Land Company along Bull branch of Tug fork, one mile and a half northeast of Glenhayes, where a prospect opening was made by Mr. C. C. MacKubin, manager of said Company, and the following section was measured:

Section of Glenhayes Land Company's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Shale		2	0
Coal, medium hard.....0' 11"	}	5	0
Coal, bony.....0 1			
Coal, soft.....0 4			
Coal, cannel.....0 4			
Coal, soft.....0 4			
Coal, cannel.....0 2			
Coal, soft.....0 6			
Coal, semi-cannel.....0 1	}		
Coal, medium, hard.....2 3			
Slate floor, 800' A. T. B.....			
Butts, N 50° W; faces, N 40° E.			

NO. 5 BLOCK COAL IN BUTLER DISTRICT.

Opening No. 185.—The No. 5 Block coal has recently been opened by DeBarry and others on the property of the Echo Coal & Gas Company on Joels branch of Twelvepole, one mile and a half southwest of Coleman, where this coal is brought to the surface by a small anticline. Mr. DeBarry reports that the coal measured nearly six feet, but doubtless the average section will prove about the same as that which is mined at East Lynn; elevation, 690' A. T. aneroid.

Opening No. 186 is located on the property of Mrs. Cora Ball along the Greenbrier branch of Trace creek, West fork of Twelvepole, S 30' W, 6 miles from Wayne, where the coal rising above the surface on a small roll is mined for local use, and the following section was measured:

Section of Mrs. Cora Ball's Coal Opening.

		Ft.	In.
Slate roof.....			
Coal .....1' 0"	}	5	8
Slate .....0 4			
Coal, bony splint.....1 0			
Slate .....1 0			
Coal, bony.....0 4			
Coal, hard, block, visible, 645' A. T. B.....2 0			

Opening No. 186(a) is located on land of James Ferguson along Lick fork of Mill creek, one mile east of Ft. Gay,

where the coal is mined for local use, and the following section was measured:

Section of James Ferguson's Coal Opening.

		Ft.	In.
(1)	Slate roof.....		
(2)	Coal .....0' 2"		
(3)	Coal, bony.....0 2		
(4)	Coal, hard, block.....2 8		
(5)	Slate floor 620' A. T. B.....		
Sample for analysis was taken from section No. 4.			

The No. 5 Block coal rises northwestward above the bed of Big Sandy just south of Kenova, and was once mined near the bank of the river, where the coal is reported to be 3 feet thick.

FLORA OF THE ALLEGHENY SERIES.

Dr. David White, the eminent paleobotanist of the U. S. G. Survey, has studied the collection of fossil plants made by himself, Mr. M. R. Campbell and others from shales in the Allegheny series at Mason, Clendennin, Pleasant Retreat and other localities in Clay and Kanawha counties and from apparently the same horizon at Furnace Hollow, Wayne county. The list of plants identified from this horizon are given in a paper published by Mr. White, March, 1900, in the Bulletin of the Geological Society of America, pages 170-172 inclusive, from which the following quotations are made:

Floras Succeeding the Kanawha Formation.

Plants less than 200 feet above the "Black Flint."

"As bearing upon the question of the position of the Stockton Flora in the Pennsylvania Region, while further showing the occurrence of the typical Pennsylvania Floras, it is of interest to glance at the floras succeeding the Stockton in the southern West Virginia section. I, therefore, append three lists of plants from higher horizons in the same section."

"The first of these floras from localities¹ which Mr. Campbell informs me lie 200 feet above the Black Flint, is as follows:

Name.	Locality.
<i>Pseudopecopteris obstusiloba</i> (Sternb) Lx.....	Wayne.
" <i>squamosa</i> (Lx), Large.....	Clen., Wayne.
<i>Mariopteris sillimanni</i> (Lx).....	Gr., Wayne.
" <i>nervosa</i> (Brongn) Zeill.....	Wayne, Liz.
" <i>newberryi</i> (Lx).....	Clen.
<i>Sphenopteris Solida</i> Lx.....	Wayne.
" <i>chaerophylloides</i> (Brongn) Presl.....	Clen.
" <i>mixta</i> Schimp.....	Wayne, Liz.
" <i>ophioglossoides</i> (Lx).....	Clen., Cob, Wayne, Liz.
<i>Pecopteris emarginata</i> (Goepp) Presl.....	Cob, P. R.
" <i>unita</i> Brongn.....	Clen., Wayne, Liz.
" <i>solida</i> Lx.....	Clen.
" <i>villosa</i> Brongn?.....	Gr., Clen., Wayne, Cob, Liz.
" <i>vestita</i> Lx.....	Clen.
" <i>oreopteridia</i> (Schloth) Sternb.....	Gr.
" cf. <i>jenneyi</i> D. W.....	Wayne.
" <i>miltoni</i> (Artis)?.....	P. R., Wayne.
<i>Alethopteris serlii</i> (Brongn) Goepp.....	Wayne.
<i>Neuropteris rarinervis</i> Bunby.....	P. R., Liz.
" <i>vermicularis</i> Lx.....	G. H.
" <i>fimbriata</i> Lx.....	Clen., Wayne.
" <i>ovata</i> Hoffm.....	Clen., P. R., Wayne.
" <i>scheuchzeri</i> Hoffm.....	Gr., Clen., P. R., Wayne.
<i>Odontopteris subcuneata</i> Bunby.....	Gr.
" <i>aequalis</i> Lx.....	Liz.
<i>Calamites cistii</i> Brongn.....	Clen.
<i>Annularia ramosa</i> Weiss.....	Wayne.
" <i>stella</i> (Schloth) Wood*.....	Gr., Cob, P. R., Wayne.
" <i>sphenophylloides</i> (Zenk) Gutb*.....	Gr., Wayne.
<i>Sphenophyllum emarginatum</i> Brongn.....	Clen., Cob, Wayne, Liz.
" <i>majus</i> Bronn*.....	Clen., Wayne.
<i>Lycopodites pendulus</i> Lx.....	Wayne.
<i>Lepidophyllum brevifolium</i> Lx.....	Clen.
" <i>odlongifolium</i> Lx*.....	Clen., Liz.
<i>Lepidocystis vesicularis</i> Lx.....	Wayne, Liz.
<i>Sigillaria camptotaenia</i> Wood*.....	Clen.
" <i>fissa</i> Lx*.....	Wayne.
<i>Cordaicarpon gutbieri</i> Gein*.....	Wayne.
<i>Carpolithes ellipticus</i> Sternb*.....	Cob.

¹The collections here roughly listed are Graham Mine, Mason (Gr.); along the Elk river one mile above Clendennin (Clen.); Cob Mine near Clendennin (Cob); from a horizon about 200 feet above the Black Flint, one-half mile east of Pleasant Retreat (P. R.); Left fork of Mill creek, Wayne county (Wayne); south of summit on Belva and Lizemore road (Liz.); Gunter Hollow, near Mason (G. H.).

*Forms apparently identical with those in the Allegheny Series.

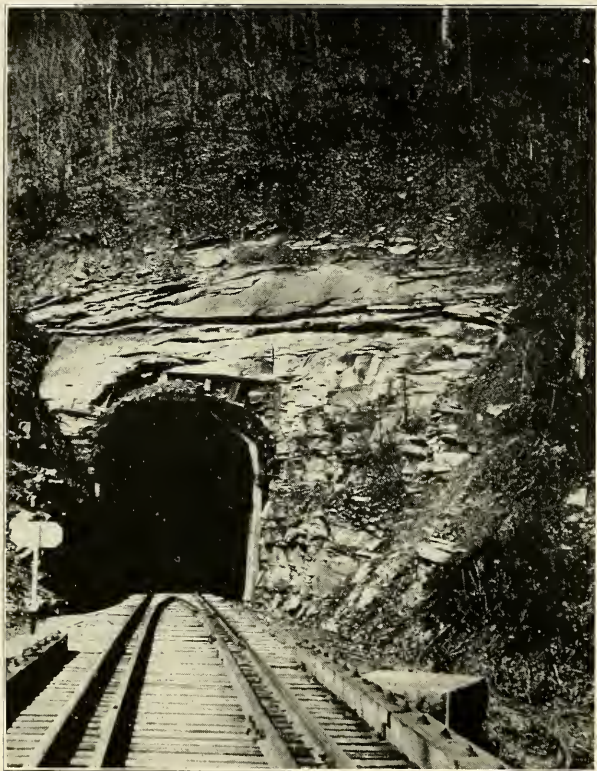


PLATE XVII.—Sproul Tunnel on the Coal River Branch of the Chesapeake and Ohio Railway, Showing the "Homewood" Sandstone.

CHAPTER VIII.

THE POTTSVILLE SERIES.

No. XII OF ROGERS.

The Pottsville series as agreed upon by geologists, begins with the top of the Homewood and extends down through a series of rocks to the Mauch Chunk Red Shale, having a thickness of 300 feet in the northern portion of the State, and 2,000 feet or more in the southeastern part of the same.

Near the eastern limit of the present coal fields was the edge of a great basin extending northeastward to the Anthracite district of Pennsylvania and southwestward to Alabama, into which the rivers from the mountain regions to the southeast poured their load of detrital material until it was filled to a depth of 2,000 feet or more with Carboniferous sediments before the peat marshes could spread westward and northward into western Pennsylvania, southeastern Ohio and northeastern Kentucky, thus making the Pottsville deposits and coal beds of the New River and Pocahontas regions distinctly older than the Pottsville of northern West Virginia, western Pennsylvania and southeastern Ohio.

According to this view, the most of the Kanawha series of coals and sediments would belong in the Pottsville of western Pennsylvania, and principally in the Mercer and Connoquenessing stages of the Beaver Group.

Dr. I. C. White has classified the Pottsville series into three great groups named respectively, Upper, Middle and Lower Pottsville, as expressed in the following scheme of classification:

Pottsville Series.	Upper	{ Beaver Group. Kanawha.	{ Homewood sandstone stage. Mercer stage. Connoquenessing sandstone stage
	Middle	{ New River Group.	{ Nuttall sandstone. Sewell coal. Raleigh sandstones. Beckley coal. Quinnimont sandstone and shales. Fire Creek coal.
	Lower	{ Pocahontas Group.	{ Flat Top Mt. sandstone. Pocahontas coals Nos. 6, 5, 4, 3, 2 and 1, with intervening sandstones and shales. Pocahontas sandstones.

THE KANAWHA SERIES OR UPPER POTTSVILLE (BEAVER GROUP).

The Kanawha series is the only group of the Pottsville that is exposed above the surface in the Cabell-Wayne-Lincoln area. This group has been still further subdivided by Dr. White into two well marked groups, the Upper and the Lower Kanawha.

The Upper Kanawha beds extend from the top of the "Homewood" sandstone to the base of a grayish white sandstone (the Lower Winifrede) underneath the Winifrede coal, and includes those coals that are of a block or splinty type, while the Lower Kanawha extends from the base of this sandstone to the top of the Nuttall sandstone, and includes the coals that are generally of a softer and more gaseous character, being good coking coals in certain parts of the area along the Kanawha and Coal rivers and their tributaries.

A few more long sections will now be given to illustrate the succession of the rocks.

The following section was measured with aneroid in descending from the east into Harts Station, Harts Creek district, Lincoln county:

Harts Station Section.

	Thickness Feet.	Total Feet.
Conemaugh Series (145')		
Sandstone, massive, rather coarse.....	60	60

	Thickness Feet.	Total Feet.	
Sandstone, sandy shale and concealed to bench.....	40	100	
Sandstone, massive.....	45	145	145'
Allegheny Series (175')			
Sandstone, sandy shale, and concealed to a bench.....	80	225	
Sandstone, sandy shale, and concealed to a bench.....	40	265	
Sandstone, sandy shale and concealed..	53	318	
Coal blossom, No. 5 Block.....	2	320	175'
Upper Kanawha (260')			
Sandstone, massive, gray, Homewood...	75	395	
Sandy shale and concealed.....	15	410	
Sandstone, massive, coarse gray, Coal-			
burg	65	475	
Sandy shale.....	5	480	
Sandstone, massive and flaggy, Upper			
Winifrede	30	510	
Fire clay and sandy shale.....	15	525	
Sandstone, gray, fine grained, micaceous,			
Lower Winifrede.....	55	580	260'
Lower Kanawha Series (50')			
Sandy shale.....	10	590	
Sandy shale and concealed to 620' A. T. B	40	630	50'

The following section was measured with aneroid in descending a hill from the north along the road to Wilsondale, Lincoln district, Wayne county:

Wilsondale Section, Lincoln County.

	Thickness Feet.	Total Feet.	
Conemaugh Series (128')			
Sandstone and concealed to bench.....	55	55	
Sandstone and concealed to bench.....	45	100	
Sandstone and sandy shale.....	28	128	128'
Allegheny Series (158')			
Fire clay.....	2	130	
Sandstone and concealed.....	60	190	
Fire clay.....	2	192	
Sandstone, massive, coarse, conglomeratic	93	285	
Coal and fire clay, No. 5 Block	1	286	
Upper Kanawha (334')			
Sandstone, massive, coarse, Homewood..	94	380	
Sandy shale.....	8	388	
Fire clay, Lewiston horizon.....	2	390	
Sandstone	60	450	
Coal, Coalburg.....	1	451	
Sandstone, Upper Winifrede.....	51	502	
Fire clay, Winifrede coal.....	3	505	
Sandstone, flaggy, and concealed, Lower			
Winifrede	47	552	

	Thickness Feet.	Total Feet.	
Coal, blossoms, Chilton.....	3	555	
Sandstone and concealed.....	65	620	334'
Lower Kanawha Series (115')			
Sandy shale	5	625	
Sandstone, micaceous, coarse, Malden....	97	722	
Coal and slate, (Cedar Grove).....	3	725	
Sandstone to 750' A. T.....	10	735	115'

The Upper Kanawha series appears to be 334 feet thick in the above section.

The following section was measured in descending from the north into Crum, Lincoln district, Wayne county:

Crum Section, Lincoln District.

	Thickness Feet.	Total Feet.	
Allegheny Series (80')			
Sandstone and concealed to bench.....	75	75	
Concealed	5	80	80'
Upper Kanawha Series (325')			
Sandstone, massive, coarse, to bench			
Homewood	70	150	
Concealed	5	155	
Sandstone and concealed.....	50	205	
Sandy shale.....	10	215	
Sandstone, massive, medium coarse, to bench	85	300	
Concealed	5	305	
Sandstone, massive, medium coarse to bench	35	340	
Concealed	5	345	
Sandstone and concealed to bench.....	60	405	325'
Lower Kanawha Series (110')			
Sandstone and concealed to bench.....	80	485	
Sandstone	8.5	493.5	
Coal and slate, Cedar Grove.....	1.5	495	
Fire clay.....	2	497	
Sandstone	8	505	
Fire clay, slate and coal to 620' A. T. B..	10	515	110'

The following section was measured with aneroid in descending hill at Kermit, Warfield district, Mingo county, and connected with the record of a gas well drilled by Guffey & Queen, of Pittsburgh, Pa., published in Volume 11 (A), page 300, West Virginia Geological Survey:

Two core drill holes were put down near Genoa, Wayne county by the Echo Oil & Gas Company, the results of which have been kindly furnished to the Survey through the courtesy of Messrs. John A. Sheppard and Wells Goodykoontz, and these sections were combined with a measurement of the strata which outcrop in the hill above the boring as given below.

The following section was measured with aneroid southward from a point $1\frac{1}{2}$ miles due east of Genoa P. O., along county road and joined to a core drill hole (W-63) on the property of Mont. Webb, drilled by Echo Oil & Gas Company, just east of junction of a private road with main county road near head of Drift branch of the West fork of Twelvepole creek, Lincoln district, Wayne county:

Section $1\frac{1}{2}$ Mile East of Genoa, Lincoln District.

	Thickness Feet.	Total Feet.	
Conemaugh Series (157')			
Sandy shale and concealed.....	85	85	
Limy shale with limestone nodules.....	5	90	
Sandstone, massive, coarse grained, friable, gray buff colored (Mahoning.....	67	157	157'
Allegheny Series (163')			
Fire clay, dark (Upper Freeport coal horizon)	3	160	
Sandy shale and concealed.....	60	220	
Fire clay (Lower Freeport coal horizon)	2	222	
Sandstone and concealed.....	45	267	
Fire clay, dark.....	3	270	
Sandy shale	5	275	
Sandstone, massive (East Lynn).....	35	310	
Fire clay, dark.....	2	312	
Shale	5	317	
Coal blossom (No. 5 Block).....	3	320	163'
Kanawha Series (360')			
Sandstone to top of Core drill hole....60'	} (Homewood Sandstone).	107 8"	427 8"
(Elevation of hole equals 705' A. T. B.)			
Surface			
Sandstone	} (Coalburg Sandstone) ..	51 2"	480 10"
Sandstone and coal (Stockton-Lewiston)			
Sandstone			
Shale	} (Coalburg Sandstone) ..	51 2"	480 10"
Sandstone			
Soft shale.....	4"	481 2"	

		Thickness	Total	
		Thickness	Thickness	
Coal	7"	Possibly a split of the Coalburg...	10"	482 2"
Clay parting	2			
Coal	3			
Dark shale	2"	}	15 9"	497 11"
Clay	1'			
Sandy shale	3 2			
Shale	11 5			
Coal	8"	}	5 5"	503 4"
Slate parting	2			
Coal	6			
Clay parting	33' 7			
Coal	4	(Upper Dunlow) (Coalburg)		
Parting	1			
Coal	1			
Slate	3' 8"	}	32 4"	535 8"
Sandstone	6			
Slate	1			
Fire clay	4 6			
Sandstone	3 6	}		
Sandy shale	11 8			
Coal			3"	535 11"
Slate	5'	}	20 "	555 11"
Sandy shale	15			
Coal			9"	556 8"
Dark slate			19 9"	576 5"
Coal	6"	(Lower Dunlow) (Winifrede)	2 3"	578 8"
Slate parting	7			
Coal	1' 2			
Clay shale	10' 2"	}	82 2"	660 10"
Sandstone	.61			
Dark slate	11			
Coal			4"	661 2"
Slate			6 8"	667 10"
Coal	3"	(Chilton?)...	1 7"	669 5"
Slate parting	2			
Coal	1' 2			
Sandy clay			4	673 5"
Sandstone			6 7"	680 0" 360'

Record of core drill hole No. 2 (W-64) located on Meeks Branch on George Ferguson tract, 3 miles northeast of Genoa, Lincoln district, Wayne county, drilled by the Genoa Oil & Gas Company. Core drill hole No. 2 (W-64) located 3 miles northeast of Genoa, Lincoln district. Elevation 770 feet aneroid.

Kanawha Series (209')	Thickness	Depth
	Feet.	Feet.
Surface	4 9"	4 9"
Sandstone	43 9"	48 6"
Coal (Stockton-Lewiston)	1 5"	49 11"

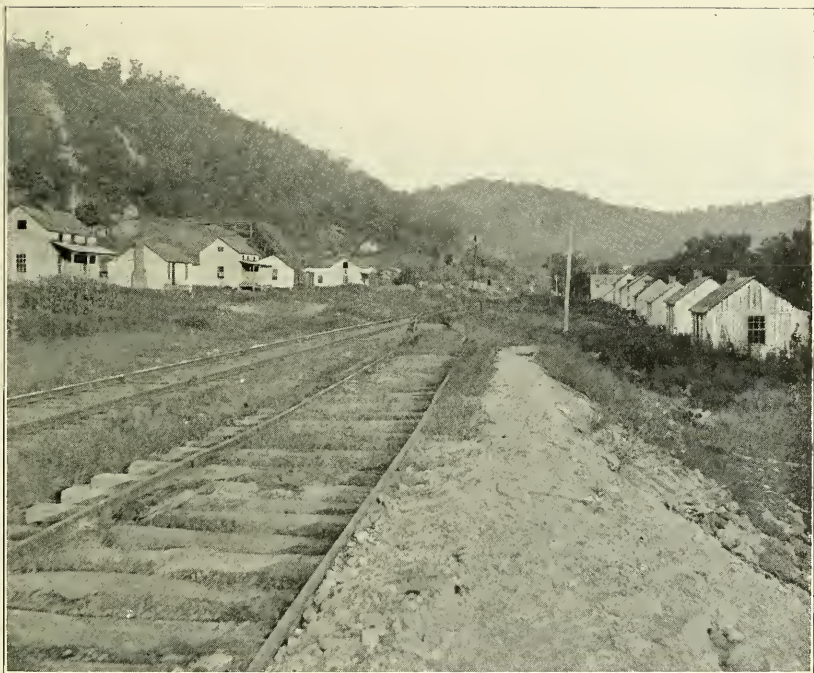


PLATE XVIII.—Mining Camp of Kenova Coal Company, Branchland,
Lincoln County.

	Thickness Feet.	Total Feet.	
Dark shale	10	59 11"	
Sandstone	112	171 11"	
Sandy shale	5	176 11"	
Sandstone	29	205 11"	
Coal .....6" }	(Lower Dunlow)		
Slate parting.....3 }	(Winifrede coal)	1 1"	207 0"
Slate and coal.....4 }			
Clay bottom	2 0"	209 0"	209'

The top of this core drill hole begins 35 feet below the No. 5 Block coal horizon, and extends through the Winifrede coal. The Coalburg coal appears to be entirely absent from this section. The interval between the Stockton-Lewiston coal and the Winifrede is 156 feet, compared with 146' 9" in core drill hole No. 1 (W-63) given in the Genoa section page 229.

Kermit Section, Mingo County.

	Thickness Feet.	Total Feet.	
Allegheny Series (145')			
Sandstone, massive, yellowish gray, coarse	50	50	
Concealed and shales.....	30	80	
Sandstone, yellowish gray, massive.....	45	125	
Concealed	10	135	
Coal, blossom, No. 5 Block.....			
Concealed	10	145	145'
Upper Kanawha (380')			
Sandstone, flaggy and concealed .....30' }			
Sandstone, flaggy and massive, limy layers near top .....30' }	Homewood 110	255	
Sandstone, coarse, yellowish massive and flaggy with limy layer near top.....50' }			
Shales, sandy and concealed.....	30	285	
Sandstone, flaggy, and massive.....	25	310	
Concealed and sandy shales.....	25	335	
Sandstone	5	340	
Concealed and sandy shales.....	35	375	
Sandstone, limy layer at top.....	30	405	
Shales, sandy.....	20	425	
Coal blossom, (Thacker).....	3	428	
Fire clay.....	7	435	
Sandstone, flaggy.....	10	445	
Shales, sandy, soft.....	30	475	
Coal blossom.....			
Shales, sandy.....	5	480	
Sandstone, massive.....	45	525	380'
Lower Kanawha Series (569')			
Coal, dirty, (Cedar Grove).....	2	527	

	Thickness Feet.	Total Feet.	
Fire clay.....	3	530	
Sandstone	10	540	
Shale, dark, iron concretions.....	25	565	
Sandstone	10	575	
Coal, Alma... { Coal ...0' 8" } { Clay ....0 8 } (Peerless) { Coal ....0 8 }	2	577	
Fire clay.....	4	581	
Sandstone, massive, and concealed.....	60	641	
Coal, Warfield, No. 2 Gas.....	5	646	
Concealed to level of top of boring.....	10	656	
Surface	28	684	
Slate, light colored.....	46	730	
Sandstone, white, hard.....	44	774	
Coal, Eagle?.....	5	779	
Slate, white, soft.....	80	859	
Sandstone, white.....	18	877	
Slate, black, soft.....	20	897	
Sandstone, white hard.....	20	917	
Slate, light colored, shelly.....	57	974	
Slate, black, soft.....	50	1024	
Slate, white, shelly.....	70	1094	569'
Middle and Lower Pottsville Series (380')			
Sandstone, white, hard, some salt water, gas and oil, Nuttall sandstone, top of Middle Pottsville.....	130	1224	
Slate, light colored.....	15	1239	
Sandstone, white, salt water, and gas....	46	1287	
Slate, light colored.....	20	1307	
Sandstone, white, salt water and gas....	112	1419	
Slate, shelly, base of Pottsville series...	55	1474	380'
Mauch Chunk Series (197')			
Red rock.....	30	1504	
Slate, light colored.....	5	1509	
Red rock.....	25	1534	
Slate, light colored.....	15	1549	
Sand, very hard.....	18	1567	
Red rock.....	10	1577	
Sand, white hard.....	24	1601	
Red rock.....	4	1605	
Slate, light colored.....	22	1627	
Limestone	4	1631	
Slate	10	1641	
Slate, shelly.....	30	1671	197'
Greenbrier Limestone (162')			
Limestone, gas near middle.....	162	1833	
Slate, shelly, some gas near top and bottom	138	1971	162'

The above section shows the Upper Kanawha group to be 380 feet, Lower Kanawha, 569 feet, and the Middle and Lower Pottsville 380 feet, making the total thickness of the Pottsville series 1,329 feet.

This section is important as it gives the thickness of the series in the southern part of the area described in this volume.

LIST AND DESCRIPTION OF THE FORMATIONS.

Upper Kanawha Group.

Sandstone, Homewood.
Coal, Stockton-Lewiston-Belmont.
Sandstone, Coalburg.
Shales.
Coal, Coalburg.
Sandstone, Upper Winifrede.
Limestone and iron ore, fossiliferous.
Coal, Winifrede.
Sandstone, Lower Winifrede.
Coal, Chilton.
Sandstone, Malden.

Lower Kanawha Group.

Coal, Cedar Grove, Thacker?
Campbells Creek Limestone.
Coal, Peerless, Alma.
Coal, No. 2 Gas, Warfield, Ansted.
Sandstone, Brownstown.
Coal, Powellton.
Coal, Eagle.
Coal, Little Eagle
Limestone, Eagle (Black Marble).
Coal, Upper War Eagle.
Coal, Middle War Eagle.
Coal, Lower War Eagle.

The Homewood Sandstone.

This sandstone, which forms the top of the Kanawha series, has also been named the **Roaring Creek sandstone** from its exposure along the lower portion of Roaring creek, a stream emptying into the Tygart Valley river in Randolph county, where it occurs in great, massive cliffs, current bedded and often pebbly.

This sandstone extends from Randolph county across the State, forming large cliffs along Elk river, between the mouth of O'Brien creek and Clendennin, where it goes under that stream and rises out of the river again a few miles northeast

of Charleston and forming the basal member of the "Charleston sandstone" of Campbell.

In the Cabell-Wayne-Lincoln area the **Homewood sandstone** is present throughout the southern part of Lincoln and Wayne counties and forms massive, current-bedded, coarse grained, often pebbly, grayish white cliffs and is one of the principal topographic features, making a line of great cliffs along Coal, Mud, Guyandot, Tug, Twelvepole and their tributaries.

In Lincoln county, the Homewood sandstone rises out of Coal river north of Sproul and forms cliffs along that stream and gradually rising above the bed of the river until at the mouth of Ivy branch, the base of the sandstone is 60 to 75 feet above water level.

This sandstone forms cliffs 40 to 60 feet high along Cobbs creek, just west of MacCorkle, and also along Horse creek. It is the great cliff maker along Mud river and forms massive ledges just south of Spurlockville, at 70 to 80 feet above the bed of the river.

The Homewood sandstone rises out of the Guyandot river between Sheridan and Branchland, and at the latter place is 50 to 60 feet thick and forming massive cliffs. This stratum rises southward until in the southern part of Lincoln county it is several hundred feet above the floor of the valley.

This sandstone rises from the East fork of Twelvepole at East Lynn, and forms cliffs in the hills along this stream to the southern edge of the county. On West fork of Twelvepole this sandstone rises above the stream at Genoa, and forms massive cliffs 80 feet high along that stream, gradually rising southward to the Wayne-Mingo line, where its base is from 200 to 250 feet above the floor of the valley.

The Homewood sandstone comes out of the bed of Tug fork at Fort Gay. The East pier of the highway bridge across Tug and Levisa forks rests on the top of this sandstone. It rises rapidly out of Tug fork to the south, and at Saltpetre the base is nearly 60 feet above the bed of the river. Here it is quarried for the U. S. Government for stone used in the construction of the dam across Tug fork at that place. It

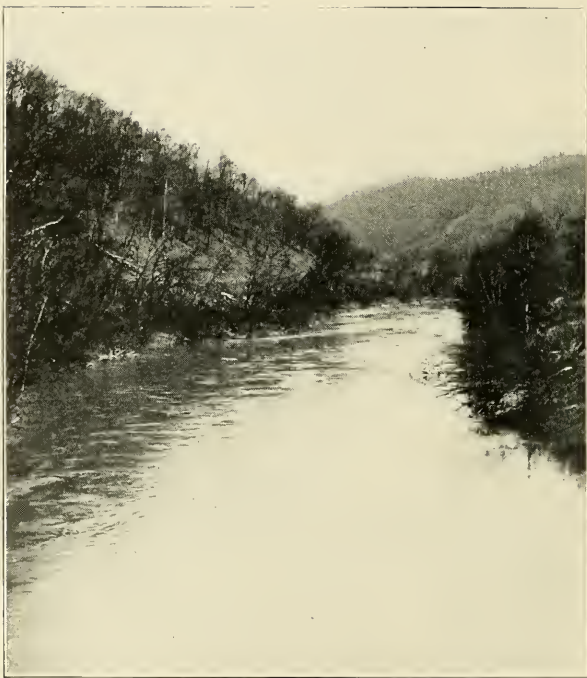


PLATE XIX.—Kanawha Series Along Coal River
North of MacCorkle, Lincoln County

rises rapidly southward and forms ledges 80 to 100 feet high near the southern boundary line of Wayne county, the base being from 450 to 500 feet above the floor of the valley.

The Stockton-Lewiston-Belmont Coal.

From five to 20 feet under the Homewood sandstone, and from 50 to 100 feet above the Coalburg coal, there occurs a great multiple bed of coal of widely extended distribution, which is generally present wherever the Kanawha series has any considerable development. This seam has been given several names. It was first named the Stockton, where it was mined as a cannel coal opposite Montgomery at Cannelton in Kanawha county, by Mr. Stockton; the Lewiston, where it was once mined at Lewiston P. O. (Winifrede Junction), 13 miles southeast of Charleston, Kanawha county. The name Lewiston has also been erroneously applied to the Winifrede and Coalburg seams. It has also been called the Belmont seam where it is mined near a village of that name on the C. & O. Railway, 23½ miles southeast of Charleston. Being a multiple seam of coal it is possibly not amiss to continue the name of this bed as the Stockton-Lewiston bed. It is a persistent bed throughout the Cabell-Wayne-Lincoln area and contains some very valuable coal deposits.

In Lincoln county, the Stockton-Lewiston coal rises out of the bed of Guyandot river just north of Branchland, and is mined at this point by the Branchland Coal Company. The coal gradually gets higher in the hills along Guyandot river until it reaches the Lincoln-Logan line, where the coal is from 300 to 400 feet above the floor of the valley.

The Stockton-Lewiston coal rises out of Coal river between Sproul and MacCorkle, and at the latter place several openings have been made in this seam, and it is this same bed which crops along the waters of Peter Cave fork of Horse creek in Washington district. It rises out of Mud river between Spurlockville and Palermo, and is opened on Stinsons branch of Left fork of Mud river, Union district.

The several coal openings on this bed in Lincoln county will be discussed by districts.

Stockton-Lewiston Coal in Washington District.

Opening No. 187 is located on the land of the Seaboard Fuel Company and mined by Mason Pell on the north side of Cobbs creek, $\frac{1}{4}$ mile west of MacCorkle, where the following section was measured:

Section of Mason Pell's Coal Opening.

			Ft.	In.
Coal	1'	6"	6	11
Slate	1	6		
Impure coal, soft.....	0	4		
Impure coal, hard, block..	1	6		
Coal, block.....	0	10		
Coal, soft (used for smithing)	1	3		
Sandstone, 635' A. T. B.....				

Opening No. 188 is located on the land of the Seaboard Fuel Company, and is mined by Walter Brogan at the mouth of Tiny branch of Cobbs creek, $\frac{1}{2}$ mile west of MacCorkle, where the following section was measured:

Section of Walter Brogan's Opening.

			Ft.	In.
Slate			8	10
Coal, (reported).....	1'	6"		
Slate	4	0		
Coal	0	4		
Coal, impure.....	0	4		
Coal, soft.....	0	10		
Coal, block.....	1	4	6	
Coal, soft.....	0	6		
Slate floor, 633' A. T. L.....				

This coal is also exposed along the bank of Cobbs creek, about 1,000 feet west of the mouth of Ely fork, where the following section was measured:

Section of Ely Fork Coal Opening.

	Ft.	In.
Sandstone		
Slate	2	4

		Ft.	In.
Coal, hard, block.....	1' 0"	6	0
Fire clay.....	1 0		
Coal	0 2		
Coal and slate.....	0 3		
Fire clay.....	1 2		
Coal and slate.....	0 4		
Coal, hard splint.....	1 0		
Coal and slate.....	0 1		
Coal, visible, 645' A. T. B.	1 0		

Opening No. 189 is located on the land of the Mohler Lumber Company along Little Coal river, S 40° W, $\frac{3}{4}$ mile from MacCorkle, where the following section was measured:

Section of Mohler Lumber Company's Coal Opening.

		Ft.	In.
Sandstone		4	0
Slate			
Coal	0' 6"	13	6 $\frac{1}{4}$
Slate	0 $\frac{1}{4}$		
Coal	0 6		
Fire clay, slate and coal.	2 0		
Coal	0 9		
Coal, bony	0 1		
Coal, medium hard.....	0 8		
Coal, hard	1 10		
Coal, gas, soft.....	0 8		
Sandstone	3 0		
Coal, hard	1 7		
Slate	0 1		
Coal	1 0		
Slate	0 1		
Coal	0 9		
Sandstone bottom, 670' A. T. B.			

Opening No. 190 is located on the land of the Mohler Lumber Company, along the Right fork of Ivy branch, S 44° W, one mile and three-quarters from MacCorkle, where the coal is mined for local fuel, and exhibits the following:

Section of Mohler Lumber Company's Coal Opening.

		Ft.	In.
Sandstone		3	0
Slate			
Coal	4' 0"	11	2
Sandstone	4 0		
Coal	0 8		
Coal, bony.....	0 1		
Coal, hard.....	1 10		
Coal, very hard splint...	0 4		
Coal, softer.....	0 3		
Slate and fire clay bottom, 715' A. T. B.			

Opening No. 191 is located on the land of the Price Heirs near the head of Trace branch of Horse creek, N $13\frac{1}{2}^{\circ}$ W, one mile and a half from Julian, where the following section was measured:

Section of Price Heirs' Coal Opening.

		Ft.	In.
Sandstone			
Slate		4	0
Fire clay and slate.....		1	6
Coal, gas, impure.....1'	0"	16	$7\frac{3}{4}$
Coal, gas.....1	2		
Coal, bony.....0	1		
Coal, very hard.....1	0		
Slate	$\frac{3}{4}$		
Coal, gas.....1	3		
Fire clay, sandstone and slate	8 0		
Coal, medium hard.....0	8		
Coal, splint.....1	4		
Slate	0 1		
Coal, hard.....1	0		
Sandstone bottom, 790' A. T. B.....			

Opening No. 192 is located on the land of the Mohler Lumber Company, near the head of Ivy creek, S 45° W, $3\frac{1}{4}$ miles from MacCorkle, where the following section was measured:

Section of Mohler Lumber Company's Coal Opening.

		Ft.	In.
Sandy shale.....			
Coal, impure.....1'	0"	16	6
Coal hard.....0	10		
Slate	0 1		
Coal, hard.....1	2		
Coal, bony.....0	1		
Coal, hard.....1	4		
Sandstone	3 0		
Coal, hard.....3	0		
Sandstone	4 6		
Coal	1 6		
Sandstone, massive, 750' A. T. B.....			

THE STOCKTON-LEWISTON COAL IN DUVAL DISTRICT.

Opening No. 193 is located on the property of the Horse Creek Land & Mining Company, on Peter Cave fork at mouth of Big branch, S 82° W, not quite two miles from Woodville, where the following section was measured:

Section of Horse Creek Land & Mining Company's Coal Opening.

		Ft.	In.
Slate			
Coal	0' 2"		
Coal and slate.....	0 6		
Coal, hard, block.....	3 4		
Sandy shale and fire clay.....	8 0	15	5
Coal and slate.....	1 0		
Coal, hard.....	1 0		
Slate	0 2		
Coal	1 3		
Slate, 755' A. T. B.....			

Opening No. 194 is located on the land of H. H. Hill, along the Left fork of Peter Cave, N 87° W, two miles from Woodville, where the coal is mined for local use, and the following section was measured:

Section of H. H. Hill's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, impure.....	0' 6"		
Slate and fire clay.....	8 0		
Coal, medium hard.....	0 8		
Slate and fire clay.....	8 0	20	6½
Coal, impure.....	0 10		
Coal, hard.....	1 0		
Slate	0 ½		
Coal, impure, 797' A. T. L.....	1 6		

STOCKTON-LEWISTON COAL IN JEFFERSON DISTRICT.

Opening No. 195 is located on Sycamore creek, at mouth of Flat creek, S 78° W, 5 miles from Woodville; where the following section was measured:

Section of Sycamore Creek Coal Opening.

			Ft.	In.
Slate				
Coal, impure.....	0'	3"		
Slate	0	½		
Coal	0	2		
Slate	0	½		
Coal	0	3	2	2
Slate	0	5		
Coal, hard, 778' A. T. L..	1	0		

It is quite probable that only a portion of the bed is exposed at this point.

Opening No. 195 (a) is located on the land of Claude Linville, along Elkins branch of Left fork of Mud river, about two miles east of Palermo, where the following section was measured:

Section of Claude Linville's Coal Opening.

			Ft.	In.
(1) Sandstone, massive.....				
(2) Coal, impure.....	1'	6"		
(3) Coal, good.....	1	2		
(4) Sandstone, blue.....	1	6		
(5) Coal and slate.....	0	10		
(6) Coal	0	1		
(7) Sandstone, blue.....	3	0		
(8) Coal and slate.....	1	2		
(9) Fire clay.....	0	2		
(10) Coal, block.....	0	3		
(11) Fire clay.....	0	7	14	1
(12) Coal	0	5		
(13) Fire clay.....	0	6		
(14) Coal	0	4		
(15) Slate	0	1		
(16) Coal	0	4		
(17) Coal, bony.....	0	2		
(18) Coal, block.....	0	4		
(19) Coal, bony.....	0	3		
(20) Coal, good, medium hard	1	5		
(21) Slate floor, 770' A. T. L.....				

Sample for analysis is taken from Nos. 14, 16, 18 and 20. Butts, N 42° W; faces, N 48° E. About 1,500 bushels of coal is mined annually.

Opening No. 196 is located on the land of Abraham Sanson, along Stinson fork of Left fork of Mud, six miles west of Woodville, where this coal has been mined for local use, and exhibits the following section:

Section of Abraham Sanson's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Slate		0	3
Coal, medium hard, block..2'	1"		
Slate and coal.....0	6		
Slate	7		
Coal, block.....0	6		
Slate	7		
Coal	3		
Coal, bony.....0	2		
Coal, gas, soft.....0	2		
Slate	11	17	6
Coal, impure.....0	4		
Coal, hard, splint.....3	0		
Slate	7		
Sandstone and slate.....5	0		
Coal, cannel, visible, 765'			
A. T. B.....1	10		
Butts N 40° W; faces N 50° E.			

Opening No. 197 is located on the land of Seth Miller, along Sanger branch of Left fork of Mud river, where the following section was measured N 58° E, 1¼ miles from Spurlockville:

Section of Seth Miller's Coal Opening.

		Ft.	In.
(1) Sandstone roof.....			
(2) Coal, block.....0'	1½"		
(3) Bone and slate....0	4		
(4) Coal, block.....1	4		
(5) Slate	2		
(6) Coal, good medium hard	1 0	3	9½
(7) Slate	1		
(8) Coal, block.....0	4		
(9) Slate	1		
(10) Coal, hard.....0	4		
(11) Slate, bottom, 840' A. T. B.....			

Butts N 41° W; faces, N 49° E. Samples for analysis taken from Nos. 2, 4, 6, 8 and 10. There is usually about 500 bushels per annum mined at this locality.

Opening No. 198 is located on the land of Milton Egnor, along Stinson branch of Left fork of Mud river, where the coal is mined for local use, and the following section was measured:

Section of Milton Egnor's Coal Opening.

	Ft.	In.
Shale roof.....		
Coal and slate.....4' 0"		
Shale .....1 6		
Coal, impure.....0 6		
Shale .....2 3		
Coal, impure.....1 2		
Slate .....0 2		
Coal, bony, locally called cannel .....2 2		
Slate bottom, 775' A. T. B.....		
Butts N 39° E; faces N 51° E.		

Opening No. 199 is located on the land of John Brumfield, along Big Ugly creek, near Leet, where the following section was measured:

Section of John Brumfield's Coal Opening.

	Ft.	In.
(1) Sandstone roof.....		
(2) Coal, impure.....0' 6"		
(3) Slate .....0 7		
(4) Coal, impure.....0 8		
(5) Slate .....0 1		
(6) Coal, hard.....1 0		
(7) Slate bottom, 775' A. T. B.....		
Butts N 47° W; faces N 43° E. Samples for analysis taken from Nos. 2, 4 and 6.		

Opening No. 200 is located on Bear branch at the roadside about $\frac{1}{2}$ mile from its mouth, where the following section was measured:

Section of Bear Branch Coal Opening.

	Ft.	In.
Sandstone		
Slate with iron nodules.....	1	0
Coal .....0' 2"		
Slate .....0 8		
Coal and slate.....0 6		
Slate .....4 0		
Coal .....0 1		
Fire clay.....0 6		
Coal, hard block.....0 2		
Bone coal.....0 2		
Coal, hard, block, visible, 780' A. T. B.....1 0		

Opening No. 201 is located on Upton creek, one mile and

a half south of Spurlockville, at an elevation of 820' A. T. B., and 80 feet below the No. 5 Block seam. The following section was measured there:

Section of Upton Creek Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, block.....0' 6"	1	6
Slate .....0 4		
Coal, hard block.....0 8		
Sandstone floor.....		

This evidently is the middle bench of the Stockton-Lewiston seam.

Opening No. 202 is located on Laurel fork of Big Ugly creek, $\frac{3}{4}$ mile northeast of Leet, at about 120 feet above the level of the creek, where the coal was once mined for local use, and exhibits the following section:

Section of Laurel Fork Coal Opening.

	Ft.	In.
Sandstone		
Cannel slate .....0' 6"	8	1
Fire clay.....0 3		
Slate .....4 0		
Coal, hard.....1 4		
Slate .....0 6		
Coal, hard.....1 0		
Coal and slate.....0 6		
Fire clay floor, 780' A. T. B.....		

STOCKTON-LEWISTON COAL IN SHERIDAN DISTRICT.

The Stockton-Lewiston coal is mined and shipped on the N. & W. R. R. in Sheridan district, at Branchland, by the Branchland Coal Company, where **opening No. 203**, on the west side of Guyandot river exhibits the following at the face of the coal in the mine:

Section at Branchland Mine.

		Ft.	In.
(1)	Sandstone roof.....		
(2)	Fire clay.....	8	0
(3)	Coal, hard.....2' 0 "	}	
(4)	Coal, gas.....0 7		
(5)	Fire clay.....0 6		
(6)	Coal, medium		
	hard .....0 8		
(7)	Fire clay.....0 7½	6	7½
(8)	Coal, splint.....0 10½	}	
(9)	Coal, bony.....0 2		
(10)	Coal, hard.....1 2		
(11)	Fire clay bottom, 615' A. T. B.....		

Butts N 40° W; faces N 50° E. Sample for analysis taken from Nos. 3, 4, 6, 8 and 10.

The company employs 35 men and has a daily capacity of 250 tons.

Opening No. 204 is located on the land of Albert Baker at the mouth of Harless of Four Mile creek. The two divisions of the seam are exposed, the lower one only being mined, where the following section was measured:

Section of Albert Baker's Mine.

		Ft.	In.
Sandstone			
Coal, hard.....0' 6"	}		
Slate			
Coal, block.....1 3			
Slate and sandstone.....8 0			
Coal and slate.....2 0		16	9
Slate	}	Coal, Upper Bench.....	1' 9"
Coal			
Bone			
Coal, hard.....2 0	}	" Lower "	3 0
Fire clay floor, 580' A. T. B.....			
		Total coal.....	4' 9"

Opening No. 205 is located on the land of the Branchland Coal Company, along Trace fork of Fourmile, where the coal is mined by Randolph Adkins for local use, as follows:

Section of Randolph Adkins' Coal Opening.

		Ft.	In.
Slate			
Coal, soft, impure.....0'	6"		
Slate	1	6	
Coal, soft, impure.....0	6		
Slate	2	0	
Coal, hard, with sulphur streaks	1	5	
Coal, semi-cannel.....0	11		
Slate and fire clay.....3	0	13	3
Soal, impure.....1	0	6	5
Coal, hard, block.....0	10		
Slate	0		
Coal, visible, 570' A. T. B..1	3		
Total coal.....			

Opening No. 206 is located on the land of the Branchland Coal Company at Brown City and is mined and shipped by Johnson Brothers' Coal Company, revealing the following section at the mining face:

Section of Johnson Brothers' Coal Opening.

		Ft.	In.
(1) Sandstone roof.....			
(2) Coal, impure.....0'	4"		
(3) Slate	0	7	
(4) Coal, hard splint.....0	8		
(5) Coal, softer.....0	9	4	3
(6) Slate	0	1½	
(7) Coal, gas, soft.....1	10		
(8) Coal, hard.....0	1		
(9) Slate, bottom, 771' A. T. L.....			

Butts N 40° W; faces, N 50° E. Sample for analysis taken from Nos. 4, 5, 7 and 8. The Company employs twelve men; has a daily capacity of 75 tons, and ships the coal by C. & O. R. R. for steam purposes.

Opening No. 207 is located on the land of Freeland Dial at the mouth of Left fork of Kentucky, S 56½° W, 2½ miles from Branchland, where the coal is mined for local use, and the following section was measured:

Section of Freeland Dial's Coal Opening.

		Ft.	In.
Sandstone, current bedded.....			
Coal, impure.....0'	10"		
Slate	0	1	
Coal, bony.....1	6		
Fire clay.....0	10	4	4
Coal, block.....0	5		
Fire clay, visible, 620' A. T. B.....0	8		

Opening No. 208 is located on the land of Almeda Dial, along Four Mile creek, $\frac{1}{2}$ mile west from Branchland, where the coal is mined for local use, and the following section was measured:

Section of Almeda Dial's Coal Opening.

		Ft.	In.
Sandstone, massive.....	1' 10"		
Coal, hard, block.....	4 0	6	4
Fire clay.....	6 6		
Coal, visible, 600' A. T. B.			

Opening No. 209 is that of the Branchland Coal Company at Branchland, on the east side of Guyandot river, where the following section was measured:

Section of Branchland Coal Company's Opening.

		Ft.	In.
Sandstone, massive.....	1' 0"		
Slate and coal.....	0 3	6	8
Fire clay.....	0 5		
Coal, gas, soft.....	2 6		
Coal, splint, hard.....	0 8		
Fire clay.....	0 2		
Coal.....	0 8		
Fire clay and slate.....	1 0		
Coal, hard, splint.....			
Fire clay bottom, 680' A. T. B.			

Opening No. 210 is located on the property of the Guyandotte Land Association, along Low Gap branch of Four Mile creek, S 12° W, one mile and three-quarters from Branchland, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
Sandstone, massive.....	0' 10"		
Slate.....	1 6	10	0
Coal, impure.....	2 0		
Fire clay.....	2 0		
Coal and slate.....	0 8		
Fire clay.....	3 0		
Coal, hard, block, visible, 690' A. T. B.			

Opening No. 211 is on the land of the Branchland Coal Company, along the Guyandot river, S 14° W, $\frac{3}{4}$ mile from

Branchland, where the coal has been opened for local use, and exhibits the following:

Section of Branchland Coal Company Opening.

		Ft.	In.
Sandstone, massive.....			
Slate		0	3
Coal, bony.....0' 10"	}		
Slate			
Coal, soft.....1 3			
Slate			
Coal, hard.....0 9		7	3
Fire clay.....0 6			
Coal and slate, impure...1 1			
Fire clay.....1 6	}		
Coal, hard, visible, 700'			
A. T. B.....1 0			

STOCKTON-LEWISTON COAL IN LAUREL HILL DISTRICT.

The Stockton-Lewiston coal occurs from 200 to 250 feet above the floor of the valley in Laurel Hill district, and not many openings have been made therein.

Opening No. 212 is on the land of Charles Lambert, along Steer branch of Fourteen Mile creek, S 22° W, 3½ miles from Ranger, where the coal is mined for local use, and the following section was measured:

Section of Charles Lambert's Coal Opening.

		Ft.	In.
Sandstone, fine grained, micaceous, ferruginous...			
Coal	}		
Slate			
Coal, hard, block.....0 6			
Slate		3	0
Coal, hard, block, visible,	}		
840' A. T. B.....1 6			

Opening No. 213 is on the land of Mrs. Louise Hager, west side of Guyandot river, ½ mile south of Six Mile creek, where the coal is mined for local fuel, and exhibits the following:

Section of Mrs. Louise Hager's Coal Opening.

		Ft.	In.
Sandstone roof.....			
Coal, block.....	1' 0"		
Sandstone	0 6		
Coal, block.....	0 6		
Slate	0 1		
Coal, hard, block.....	2 6		
Fire clay and slate.....	0 5	8	4
Coal, hard block.....	0 8		
Slate	0 2		
Coal, block.....	2 6		
Fire clay bottom, 825' A. T. B.....			

Opening No. 214 is on Big creek of Mud river, N 69° W, 2¾ miles from Spurlockville, where the following section was measured:

Section of Big Creek Coal Opening.

		Ft.	In.
Sandstone			
Slate		0	3
Coal	0' 3"		
Slate	0 2		
Coal	0 6		
Slate	1 0		
Coal	0 4	3	11½
Slate	0 2		
Coal, hard, block.....	0 6		
Slate	0 0½		
Coal	1 0		
Slate bottom, 740' A. T. B.....			

STOCKTON-LEWISTON COAL IN HARTS CREEK DISTRICT.

The Stockton-Lewiston coal lies from 250 to 325 feet above the bed of the valley in Harts Creek district, where several openings have been made, all showing that the seam is often of workable thickness.

Opening No. 215 is on the property of the Guyandotte Land Association, at the head of East fork of Twelvepole, where the following section was measured:



PLATE XX.—Pumping Sand out of Coal River, at Forks of Coal.

Section of Guyandotte Land Association's Coal Opening.

			Ft.	In.
Sandstone, massive.....				
Coal, hard.....	0'	10"	1	10
Slate	0	2		
Coal, hard.....	0	3		
Slate	0	1		
Coal, visible, 855' A. T. B.	0	6		

Opening No. 216 is on the land of James Dalton, along Big branch of Big Hart creek, S $72\frac{1}{2}^{\circ}$ W, $3\frac{1}{2}$ miles from Ferrellsburg, where the coal is mined for local fuel, and exhibits the following:

Section of James Dalton's Coal Opening.

			Ft.	In.
Sandstone, massive.....				
Coal, block.....	1'	0"	9	1
Coal, gas, soft.....	1	0		
Slate	0	2		
Coal, impure.....	0	2		
Fire clay and slate.....	0	8		
Coal and slate.....	1	10		
Slate and fire clay.....	3	0	1	3
Coal, impure, 865' A. T. B.	1	3		

Opening No. 217 is on the land of William Midkiff, along Dry run of Guyandot river, N 69° W, 2 miles from Atenville, where the coal is mined for local fuel, and the following section was measured:

William Midkiff's Coal Opening.

			Ft.	In.
(1) Sandstone, massive.....				
(2) Slate	0'	$0\frac{1}{2}"$	3	$2\frac{1}{2}$
(3) Coal, block.....	1	3		
(4) Slate and fire clay.....	0	6		
(5) Coal, bony.....	0	1		
(6) Coal, block.....	0	10		
(7) Slate	0	1		
(8) Coal, block.....	0	5	1	3
(9) Slate bottom, 850' A. T. B.....				

Butts N 38° W; faces, N 52° E. Sample for analysis taken from Nos. 3, 6 and 8.

Opening No. 218 is on the land of Samuel Adkins, along

East fork of Big Hart creek, S 59° W, ¾ mile from Ferrellsburg, where the coal is mined for local fuel, and the following section was measured:

Section of Samuel Adkins' Coal Opening.

		Ft.	In.
(1) Sandstone, massive.....			
(2) Coal, good, block.....0' 9"	}	2	10
(3) Slate .....0 1			
(4) Coal, block.....0 8			
(5) Coal, bony.....0 3			
(6) Coal, impure.....1 1			
(7) Slate bottom, 850' A. T. B.....			

Butts N 39° W; faces, N 51° E. Sample for analysis taken from Nos. 2, 4 and 6.

Opening No. 219 is on the land of Mrs. Melissa Adkins, west side of Guyandot river, N 65° W, one-half mile from Ferrellsburg, where the coal is mined for local fuel, and the following section was measured:

Section of Mrs. Melissa Adkins' Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, hard, block.....0' 8"	}	3	0
Fire clay .....0 4			
Coal and slate.....1 0			
Coal hard, block, 850' A. T. B.....1 0			

Opening No. 220 is on the land of B. F. Fowler along Big Hart creek, S 87° W, 1¼ miles from Ferrellsburg, where the coal is mined for local fuel, and exhibits the following:

Section of B. F. Fowler's Coal Opening.

		Ft.	In.
Sandstone			
Coal, hard, splint.....0' 9"	}	2	11
Slate .....0 3			
Coal, hard.....1 6			
Slate .....0 1			
Coal .....0 4			
Fire clay bottom.....			

Opening No. 220 (a)—A. J. Vance is mining the Stockton-Lewiston coal on the East fork of Twelvepole, just above the mouth of Laurel branch, Hart's Creek district, where the following section was measured:

Section of A. J. Vance's Coal Opening.

		Ft.	In.
Sandstone			
Shale and slate.....		6	0
Coal	0' 10"	3	9
Coal and slate.....	1 1		
Coal, splint.....	1 6		
Slate	0 1		
Coal, visible, 995' A. T. A..	0 3		

STOCKTON-LEWISTON COAL IN WAYNE COUNTY.

The Stockton-Lewiston coal comes to the surface in Wayne county, south of the center of the same and gradually rises southward until it is from 200 to 400 feet above the bed of the valley. It rises out of East fork of Twelvepole, just south of Stiltner, where its outcrop shows in the county road. It comes above the West fork of Twelvepole between Genoa and Flemming, and it appears above the Tug fork of Sandy just north of Saltpetre. The different measurements of this coal bed in Wayne county will now be taken up by districts.

STOCKTON-LEWISTON COAL IN STONEWALL DISTRICT.

Opening No. 221 is on the land of Mrs. Nora Castell, along the Right fork of Camp creek, 2 miles east of East Lynn, where the coal is opened and the following measurement was taken:

Section of Mrs. Nora Castell's Coal Opening.

			Ft.	In.
Sandstone				
Coal and bone.....	0'	9"		
Slate	0	4		
Coal, medium soft.....	1	0		
Fire clay.....	3	0		
Coal, block.....	0	10		
Slate	0	4		
Coal, hard, bony, 655'				
A. T. B.....	0	6		
			6	9

The above section was the only opening found in this seam within Stonewall district. The blossom of the bed was observed in a great many other localities, but at no place was the exposure such that a section could be measured.

THE STOCKTON-LEWISTON COAL IN GRANT DISTRICT.

Opening No. 222 is on the land of John Smith, along Rich creek of Twelvepole, S 14° E, 5¼ miles from East Lynn where the following measurement was taken:

Section of John Smith's Coal Opening.

			Ft.	In.
Sandy shale and slate.....			3	0
Coal	0'	6"		
Fire clay.....	0	4		
Coal, impure.....	1	4		
Fire clay.....	0	5		
Coal, visible.....	1	6		
			4	1

Opening No. 223 is on the land of William Adkins, along Blue Lick branch of Twelvepole, S 25° E, 6½ miles from East Lynn, where the coal is mined for local fuel, and the following section was measured:

Section of William Adkins' Coal Opening.

	Ft.	In.
Slaty shale.....	5	0

			Ft.	In.
Coal, block.....	0'	1"		
Slate	0	3		
Shale	1	0		
Coal, impure.....	0	8		
Slate	0	11	6	2
Coal, impure.....	1	1		
Slate	0	6		
Coal, bony.....	0	8		
Coal, impure, 790' A. T. B.....	1	0		

Opening No. 224 is on the land of Elijah Smith, along Beechy branch of East fork of Twelvepole, where the following section was measured:

Section of Elijah Smith's Coal Opening.

			Ft.	In.
Shale roof.....	4'	0"		
Slate, fire clay and coal....	1	3		
Fire clay and slate.....	1	0		
Coal, impure.....	0	8		
Fire clay.....	1	2	10	6
Coal, impure.....	0	8		
Slate and coal.....	1	0		
Coal, block.....	1	0		
Coal, bony, 840' A. T. B....	0	9		

Stockton-Lewiston Coal in Lincoln District.

Opening No. 225 is on West fork of Twelvepole, $\frac{1}{2}$ mile north of Ferguson Station, where the following section was measured:

Section of Ferguson Coal Opening.

			Ft.	In.
Sandstone			0	3
Fire clay.....				
Coal, block.....	1'	10"		
Coal, gas, soft.....	0	1		
Coal, splint.....	1	6	3	11
Fire clay or slate.....	0	1		
Coal, visible, 780' A. T....	0	5		

The Wells Branch Coal Company in 1894 leased from Messrs. Miller and Sands, coal lands located on Wells branch and extending over to Moses branch, constructing one mile of railroad up Wells branch, and putting in operation a mine

on the No. 5 Block coal, shipped this coal for about two years. Later, this company disposed of its holdings to the Bradley Cannel Coal Company which tunneled through the hill on No. 5 Block coal and constructed a hoistway to the Stockton-Lewiston seam which occurs there 100 feet vertically below the No. 5 Block, and is nearly all cannel coal. The cannel was reported to be 44 inches thick on Lower Sandlick of Moses creek, but as it soon changed to bituminous coal, the Company abandoned its mine. **Opening No. 226** is at the entrance to the old cannel mine, located on Lower Sand Lick branch of Moses creek, where the following section was measured:

Section of Lower Sand Lick Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, gas.....1' 6"	}	2	8
Coal, cannel.....1 2			
Slate and fire clay, 915' A. T. B.....		1	0

Opening No. 227 is on the land of A. W. Wilson, along a branch of West fork of Twelvepole, $\frac{1}{4}$ mile south of Wilson-dale, where the coal is mined for local fuel, and the following section was measured:

Section of A. W. Wilson's Coal Opening.

		Ft.	In.
Sandstone			
Coal, block	0' ¾"	3	½
Slate	0 ¼		
Coal	0 1		
Slate	0 ½		
Coal, hard splint.....	1 2		
Slate and fire clay.....	0 8		
Coal, gas, visible, 945' A. T. B.....	1 0		

Opening No. 228 is on the land of David Wheeler, just east of Saltpetre, where the coal is mined for local fuel, and the following section was measured:

Section of David Wheeler's Coal Opening.

		Ft.	In.
Shale			
Black slate.....	0' 4"		
Coal and slate.....	0 4		
Coal, semi-cannel.....	0 5		
Coal and slate.....	0 6		
Coal	0 4		
Coal and slate.....	0 4		
Coal, gray splint.....	2 2		
Coal and bone.....	0 4		
Fire clay bottom, 645' A. T. B.....			

The foregoing openings give the general section and structure of the Stockton-Lewiston bed in the Cabell-Wayne-Lincoln area.

The Coalburg Sandstone.

From 5 to 10 feet beneath the Stockton-Lewiston coal there usually occurs a massive coarse grained, bluish-gray sandstone that was named the **Coalburg sandstone** by Dr. I. C. White, from its occurrence over the coal of that name. This sandstone often weathers into "Chimney Towers" and "Table Rocks" when exposed on summits. In Lincoln county the Coalburg sandstone occurs near the southern part of the county, and rising out of Coal river near MacCorkle, is exposed along the Coal River Railroad grade south of MacCorkle at Ivy branch in a grayish white cliff 50 feet high, containing some iron ore nodules. It also forms the "Chimney Tower" at Pinnacle Tunnel, one mile south of Ivy branch.

The base of this sandstone rises out of Mud river at Spurlockville and forms cliffs from 50 to 60 feet high south of that village.

The base of the Coalburg sandstone rises out of Guyandot river between Branchland and Brown City and forms cliffs in the river hills to the south. It also comes above the East fork of Twelvepole between Stiltner and Cover Creek F. O. It rises out of West fork of Twelvepole at Ferguson and forms cliffs 30 to 50 feet high to the south of this point. On the Tug fork of Big Sandy above Saltpetre it forms cliffs 50 to 70 feet high along Tug fork, having been quarried at several places along Tug fork and used in the culverts and bridge piers of the N. & W. Railway.

The Coalburg Coal.

Underlying the Coalburg sandstone from 0 to 10 feet is the next seam of coal which has been named the **Coalburg bed** from its occurrence near a small town of that name on the Kanawha river in Kanawha county, where the coal was first mined on a commercial scale, and where mining operations on this seam first established the character and reputation of the Kanawha "splint" coals in the commercial markets of the country.

This bed contains much splint coal as well as alternate layers of soft, or "gas" coal and one or more partings of shale. Frequently the layers of shale will thicken into several feet of rock material.

In Lincoln county, the Coalburg bed has been prospected but little, and so far as developed the coal appears to be divided by layers of shale and slate.

Opening No. 231 is on land of Paris Brumfield, one mile north of Harts Station, along a branch of the Guyandot river in Harts Creek district, where the coal is mined for local fuel, and the following section was measured:

Section of Paris Brumfield's Coal Opening.

	Ft.	In.
Sandstone, massive.....		
Coal, hard.....0' 8"	}	2 10
Slate .....0 3		
Coal, hard, splint.....1 3		
Fire clay, visible, 745' A. T. B.....0 8		

Opening No. 232 is on the land of Joseph Gill at Gill P. O., Hart's Creek district, where the coal is mined for local fuel, and the following section was measured:

Section of Joseph Gill's Coal Opening.

	Ft.	In.
Sandstone		
Coal, hard, splint.....1' 4"	}	4 3
Slate .....1 3		
Coal, gas, 695' A. T. B.....1 8		

Opening No. 233 is located in Jefferson district, at Spurlockville, on the land of Thomas Spurlock, where the coal has been mined for local fuel, and the following section was measured:

Section of Thomas Spurlock's Coal Opening.

		Ft.	In.
Sandstone			
Slate, fossil plants.....		4	0
Coal, hard.....0'	1"	}	3 10
Fire clay.....0	6		
Coal, splint.....0	2		
Coal, bony.....0	6		
Coal, very hard.....0	4		
Slate	1		
Coal, bony.....0	4		
Coal, splint.....1	10		
Slate bottom, 725' A. T. B.....			

In Wayne county the Coalburg coal rises to the surface in the southern part of the county. On the East fork of Twelvepole the coal rises above the bed of the creek south of Cove Creek P. O.

Opening No. 234 is on the east side of East fork of Twelvepole, $\frac{1}{2}$ mile southeast of Cove Creek P. O., where this bed has been mined for local fuel, and the following section was measured:

Section of Cove Creek Coal Opening.

		Ft.	In.
Sandstone and shale.....			
Coal, block.....0'	1½"	}	7 5
Shale	1 9½		
Coal	0 2		
Slate	0 2		
Coal and slate.....0	8		
Slate, dark.....0	7		
Coal, impure.....1	3		
Slate	0 9		
Coal, splint.....1	6		
Slate	0 2		
Coal, visible, 640' A. T. B.0	3		

The coal is exposed along the road south of Cove Creek P. O. and several openings have been made which show about the same section as the one given above.

Opening No. 235 is on the land of T. P. Maynard at Kiahville along the East fork of Twelvepole, where the coal is mined for local fuel, and the following section was measured:

Section of T. P. Maynard's Coal Opening.

			Ft.	In.
Slate roof.....	0'	2"		
Coal, cannel.....	0	7		
Slate, dark.....	0	9		
Coal, impure.....	0	5		
Slate, dark.....	0	2	4	8
Coal, impure.....	1	9		
Slate, dark.....	0	10		
Coal, splint, visible, 715' A. T. B.....	0	10		

Opening No. 236 is on the land of Joseph Maynard along the East fork of Twelvepole, $\frac{1}{2}$ mile south of Eloise P. O., where the coal is mined for local fuel, and the following section was measured:

Section of Joseph Maynard's Coal Opening.

			Ft.	In.
Slate	0'	7"		
Coal, hard, block.....	0	10		
Slate	10	0	3	9
Coal, block.....	1	0		
Slate	0	6		
Coal, visible, 742' A. T. B. and 12' above Twelvepole.	0	6		

Opening No. 237 is on the land of John Tomlin along the East fork of Twelvepole at the mouth of Blue Water branch, Grant district, one mile and a half south of Eloise, where the coal is mined for local use, and the following section was measured:

Section of John Tomlin's Coal Opening.

			Ft.	In.
Slate roof.....	0'	7"		
Coal, hard.....	0	8		
Slate	0	1	3	6
Coal, impure.....	0	10		
Slate	1	4		
Coal, block.....	1	4		
Fire clay bottom, 770' A. T. B.....				

Opening No. 238 is at Ferguson on the West fork of Twelvepole, where an attempt was once made to mine the coal, and the following section was measured:

Section of Ferguson's Coal Opening.

	Ft.	In.
Slate with iron ore nodules.....	0	8
Coal .....0' 6"	1	4
Slate .....0 4		
Coal .....0 6		
Slate floor, 660' A. T. B.....		

The Coalburg bed was once mined and shipped by rail at Dunlow and was locally known as the **Upper Dunlow seam**. The following section was measured in the old drift of the abandoned mine at Opening No. 239:

Section of Dunlow Mine Coal Opening.

	Ft.	In.
Sandstone		
Slate .....1' 6"	4	6
Coal and slate.....1 0		
Coal, visible, 780' A. T. B..2 0		

Opening No. 240 is on the land of Moses Smith along Sycamore branch of West fork of Twelvepole, 2 miles north-east of Dunlow, Lincoln district, where the following section was measured:

Section of Moses Smith's Coal Opening.

	Ft.	In.
Sandstone		
Slate	0	6
Coal, hard, block.....1' 0"	3	8
Slate .....0 8		
Coal, hard block, 760' A. T. B.....2 0		

Opening No. 241 is on the property of the Guyandotte Land Association at the head of Gourd branch, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
Coal	1' 0"	9	3
Fire clay.....	0 8		
Coal	1 3		
Fire clay and sandstone...	5 0		
Coal and shale, 890' A. T. B.	1 4		

Opening No. 242 is on the land of Lewis Morgan near the mouth of Crane Nest branch of East fork of Twelvepole, Grant district, where the coal is mined for local use, and the following section was measured:

Section of Lewis Morgan's Coal Opening.

		Ft.	In.
Sandstone, massive.....		4	0
Shale			
Coal, block.....	0' 2"		
Slate, dark.....	0 6		
Coal, impure.....	1 0		
Slate	1 6	4	10
Coal, block.....	1 8		
Fire clay bottom, 750' A. T. B.			

From the sections of the Coalburg coal given in the preceding pages, it is evident that this bed is divided by numerous bands of shale and slate and at present has not much economic value within the Cabell-Wayne-Lincoln area unless other openings shall disclose more thickness and purity for this seam.

The Upper Winifrede Sandstone.

Underlying the Coalburg coal from 10 to 25 feet, occurs a massive, brownish gray sandstone, fine grained below, but generally with a coarser grain in its upper half. This sandstone was named by Dr. I. C. White the **Upper Winifrede**, from its occurrence over the Winifrede coal bed. It usually has a smooth lower surface, unlike most of the sandstones, which form the immediate roofs of coal beds; is very regular and does not cut into the underlying coal, but forms an even

roof. The coal does not adhere or stick to the sandstone, but mines from it as freely as that from a slate roof.

This stratum makes good building stone and has been used by the Norfolk and Western Railway for constructing culverts and bridge piers.

The Winifrede Coal.

Underlying the Upper Winifrede sandstone from 0 to 10 feet is one of the important coals in the Kanawha series. This bed was named the **Winifrede coal** from the mining village of Winifrede on Fields creek, Kanawha county, where the coal was first mined for commercial purposes as early as 1855. It is always a multiple bed, having slate and shale partings and often sandstone.

In Lincoln, the Winifrede coal occurs in the southern part of the county, near the Logan-Lincoln line, along the Guyandot river and its tributaries. This coal will now be discussed by districts.

THE WINIFREDE COAL IN LAUREL HILL DISTRICT.

Opening No. 243 is on the land of Henry Dias, near the head of Fourteen Mile creek, S 28° W, 2½ miles from Ranger, where the coal is mined for local fuel, and the following section was measured:

Section of Henry Dias' Coal Opening.

	Ft.	In.
Sandston, buff.....		
Coal, hard, block.....1' 0"		
Slate	0	1
Coal and slate.....	0	3
Coal, hard block.....	0	8
Fire clay.....	0	5
Coal, hard.....	0	4
Fire clay.....	0	5
Coal, good.....	0	1
Fire clay, visible, 685' A. T. B.....		
	3	3

Opening No. 244 is on the property of Columbus Cross

along Steer fork of Fourteen Mile creek, S 24° W, $2\frac{3}{4}$ miles from Ranger, where the coal is mined for local use, and the following section was measured:

Section of Columbus Cross' Coal Opening.

	Ft.	In.
Sandstone, massive, buff.....		
Coal, hard.....1' 6"	6	0
Fire clay.....0 8		
Coal, hard, block.....0 4		
Fire clay, coal and slate...2 6		
Coal, hard, block, visible, 680' A. T. B.....1 0		

Opening No. 245 is on the land of Mr. Cummings, near the mouth of Furnett creek, $\frac{1}{4}$ mile east of Bradyville, where the coal is mined for local use, and the following section was measured:

Section of Cummings' Coal Opening.

	Ft.	In.
Sandstone, massive, visible.....	2	0
Fire clay and slate.....	0	3
Coal, hard, block.....0' 8"	2	3
Slate .....0 1		
Coal, hard, visible, 675' A. T. B.....1 6		

Opening No. 246 is on the land of John Miller along Hamilton creek, N 44° E, 1 mile from Lattin, where the following section was measured:

Section of John Miller's Coal Opening.

	Ft.	In.
Sandstone, massive.....		
Slate and coal.....0' 4"	1	11
Coal, gas.....0 6		
Fire clay.....0 7		
Coal, soft.....0 6		
Fire clay bottom, 680' A. T. B.		

The Winifrede coal is exposed at several localities on Fourteen Mile creek along the county road. The following section was measured one-half mile north of Fourteen P. O at Opening No. 247.

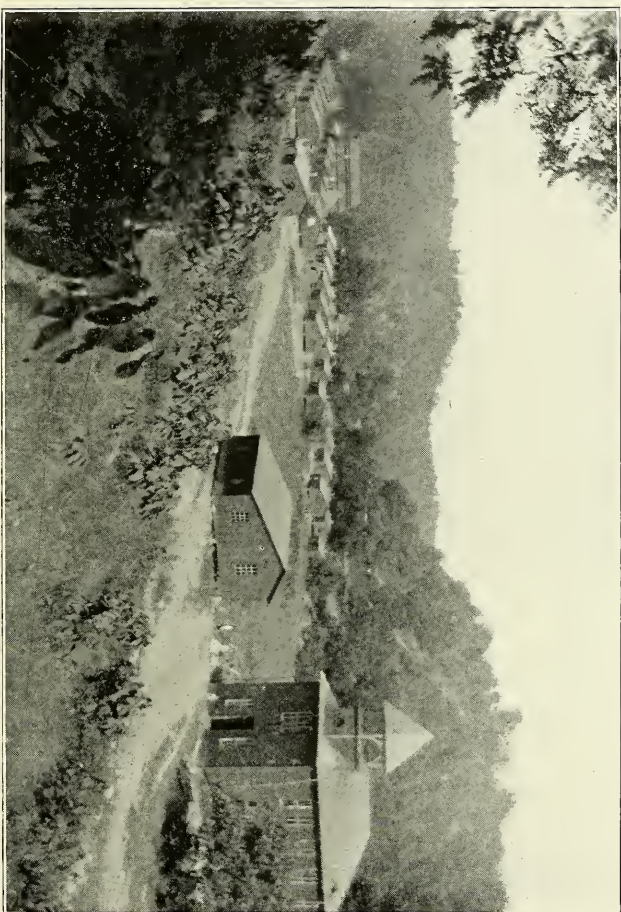


PLATE XXI.—Mining Camp of Branchland Coal Company, Branchland, Lincoln County.

Section of Fourteen Mile Coal Opening.

		Ft.	In.
Sandstone, massive, medium coarse grained.....			
Coal, impure.....0' 8"	}	2	1
Slate .....0 2			
Coal and slate.....1 3			
Fire clay floor, 715' A. T. B.....			

Opening No. 248, about 1 mile north of Fourteen P. O., shows as follows:

Section of Fourteen Mile Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, hard, block.....0' 8"	}	5	7
Slate, coal and fire			
clay mixed.....0 7			
Coal, medium hard.....0 3			
Fire clay.....1 6			
Coal, impure.....0 4			
Fire clay and slate.....1 0			
Fire clay, visible,			
690' A. T. B.....1 3			

Opening No. 248 (a) is located on the land of Thomas Vickers along Hamilton creek, one mile northeast of Lattin, where the following section was measured:

Section of Thomas Vickers' Coal Opening.

		Ft.	In.
(1) Slate and shale roof.....			
(2) Coal, impure.....0' 3"	}	3	8
(3) Coal, gas.....0 8			
(4) Slate and fire clay...0 4			
(5) Coal, impure.....0 4			
(6) Coal, block.....2 1			
(7) Slate floor.....			

Sample for analysis was taken from Nos. 2, 3 and 6, for the results of which see table, page 404-405.

Opening No. 249 is located on the property of the Guyandotte Land Association along Ten Mile creek, S 43° W, 1 mile from Midkiff, where the coal is mined for local fuel use, and the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Slate and coal.....1' 0"	}		
Coal, soft.....0 4			
Slate .....0 1			
Coal .....0 3		3	2
Fire clay.....0 6			
Coal, block, visible,			
655' A. T. B.....1 0			

Opening No. 250 is located on the property of the Guyandotte Land Association at the mouth of Thomas branch of Tennile creek, S $64\frac{1}{2}^{\circ}$ W, 2 miles from Ranger, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, impure.....0' 8"	}		
Fire clay and slate.....0 8			
Coal, block.....0 1			
Fire clay and slate.....2 0		6	7
Coal, bony.....0 2			
Fire clay and slate.....1 0			
Coal, hard, block.....2 0			
Fire clay, visible, 680' A. T. B.....		0	8

The preceding sections indicate that the Winifrede coal is filled with slate partings and has not much commercial value in Laurel Hill district.

THE WINIFREDE COAL IN HARTS CREEK DISTRICT.

* Opening No. 251 is located on the property of the Lincoln Land Association, along Sand fork of Guyandot river, N 27° W, one mile and three-quarters from Ferrellsburg, where the coal is mined for local fuel, and the following section was measured:

Section of Lincoln Land Association's Coal Opening.

			Ft.	In.
Sandstone, massive, medium grained.....				
Coal, block.....	0' 2 "	}		
Slate	0 0½			
Coal, hard.....	0 1			
Slate	0 1			
Coal	0 0½			
Slate and fire clay.....	0 2			
Coal	0 0½		6	0
Slate	0 2			
Coal, hard.....	0 1½			
Fire clay and slate.....	3 0			
Coal, hard, block.....	0 10	}		
Slate	0 3			
Coal, block, visible, 720' A. T. B.....	1 0			

Opening No. 252 is located on Garten branch of Little Harts creek, S 86° W, 4½ miles from Ferrellsburg, where the following section was measured:

Section of Garten Branch Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Coal, impure.....	1' 0"	}	
Slate	0 2		2
Coal	1 0		2
Fire clay bottom, 795' A. T. B.....		1	0

Opening No. 253 is located on the land of John Kuntz along Green Shoals branch of Guyandot river, N 58° E, 2½ miles from Big Creek Station, where the coal is mined for local use, and the following section was measured:

Section of John Kuntz's Coal Opening.

		Ft.	In.
Sandstone, massive.....			
Slate		0	2
Coal, block.....	0' 5 "	}	
Fire clay	0 7		
Coal	0 0½		
Fire clay.....	0 1		
Coal, block.....	0 4½		3
Fire clay.....	0 2		4
Coal, block, visible, 765' A. T. B.....	1 8		

Opening No. 253 (a).—Richard Vance is mining the Winifrede coal on Copley Trace branch of Kiah creek, Harts Creek district, where the following section was measured:

Section of Richard Vance's Coal Opening.

			Ft.	In.
Shale and slate roof.....				
Coal, medium hard.....	0'	4"		
Slate	0	4		
Coal, medium, hard.....	0	10		
Coal, soft.....	1	0		
Coal, very hard.....	1	1		
Coal, softer, 900' A. T. B..	0	11		
			4	6

THE WINIFREDE COAL IN SHERIDAN DISTRICT.

The Winifrede coal rises above the surface near the southern part of Sheridan district, and has therefore few openings.

Opening No. 254 is located on the land of William Hedges along Fourteen Mile creek, just south of Wewanta P. O., where the coal is mined for local fuel, and the following section was measured:

Section of Wm. Hedges' Coal Opening.

			Ft.	In.
Sandstone, massive.....				
Coal, hard splint.....	1'	3"		
Fire clay.....	0	2		
Coal, gas.....	0	2		
Fire clay.....	0	1		
Coal, hard.....	0	1		
Fire clay.....	0	1		
Coal, medium, hard.....	0	3		
Fire clay.....	0	5		
Coal, hard, block.....	0	5		
Fire clay.....	0	2		
Coal, splint.....	0	2		
Fire clay.....	1	3		
Coal, gas.....	0	3		
Fire clay.....	0	8		
Coal, hard.....	0	2		
Slate and coal.....	0	4		
Coal, splint, 670' A. T. B..	0	8		
			6	7

In Wayne county very little development has been made in the Winifrede, and the seam shows thin layers of coal and

slate and very little coal of commercial value. In **Lincoln district** croppings of this bed were found at different points along Tug fork and its tributaries south of Glenhayes; but no openings were found faced up so a good section of the coal could be measured.

THE WINIFREDE COAL IN LAUREL HILL DISTRICT.

Very little development has been made in the Winifrede coal in Laurel Hill district, and from the openings observed, it is evident that this bed is impure and of little commercial value.

Opening No. 254 (a) is located on the land of Albert Gartner, along the waters of Fourteen Mile creek, about two miles south of Ranger, where the coal is mined for local use, and the following section was measured:

Section of Albert Gartner's Coal Opening.

		Ft.	In.
Shale			
Fire clay.....		3	0
Coal .....0' 7 "	}		
Slate .....0 6			
Coal .....0 2			
Slate and fire clay....1 8			
Coal, block.....0 11			
Slate .....0 1½			
Coal, block.....0 2			
Slate and fire clay....1 9			
Coal, impure.....0 8			
Coal, bony.....0 2			
Coal, impure.....0 2			
Slate .....0 1		9	3
Coal, soft.....0 1			
Fire clay.....0 1½			
Coal, medium hard....0 8			
Slate .....0 1			
Coal, block.....0 1			
Slate .....2 2			
Coal, impure.....0 6			
Slate .....0 0½			
Coal, block.....0 10			
Slate floor, 700' A. T. B.....			
Butts run N 43° W; faces, N 47° E.			

The foregoing section shows the coal so interstratified with slate and fire clay that it is of very little present com-

mercial value, although, of course, in the remote future it will probably furnish much good coal through washing and other operations by which the impurities can be separated from the coal.

In **Wayne county** very little development has been made on the **Winifrede coal**, since the bed contains thin layers of coal and slate and very little coal of commercial value. In Lincoln district, croppings of this bed were found at several points along Tug fork and its tributaries south of Glenhayes.

Opening No. 254 (a) is located in Lincoln district on the property of the Glenhayes Land Company, one mile north of Glenhayes, where Mr. C. C. McKubin, the Manager of said Company, has prospected for this coal, and the following section was measured:

Section of Glenhayes Land Company's Coal Opening.

	Ft.	In.
(1) Sandstone roof.....		
(2) Fire clay.....	1	0
(3) Coal, impure.....0' 8" }		
(4) Coal, block.....1 4 }	2	0
(5) Slate floor, 715' A. T. B.....		

Sample for analysis was taken from Nos. 3 and 4.

The Winifrede coal has also been opened along Twelvepole and its tributaries.

Opening No. 254 (b) is located in Grant district, on the land of R. W. Nelson, along East fork of Twelvepole, one mile south of Eloise P. O., where the following section was measured:

Section of R. W. Nelson's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal, gas.....0' 4½" }		
Slate .....0 8 }		
Coal, splint.....1 1 }	4	3½
Slate .....0 9 }		
Coal, impure.....1 5 }		
Fire clay floor, 750' A. T. B.....		

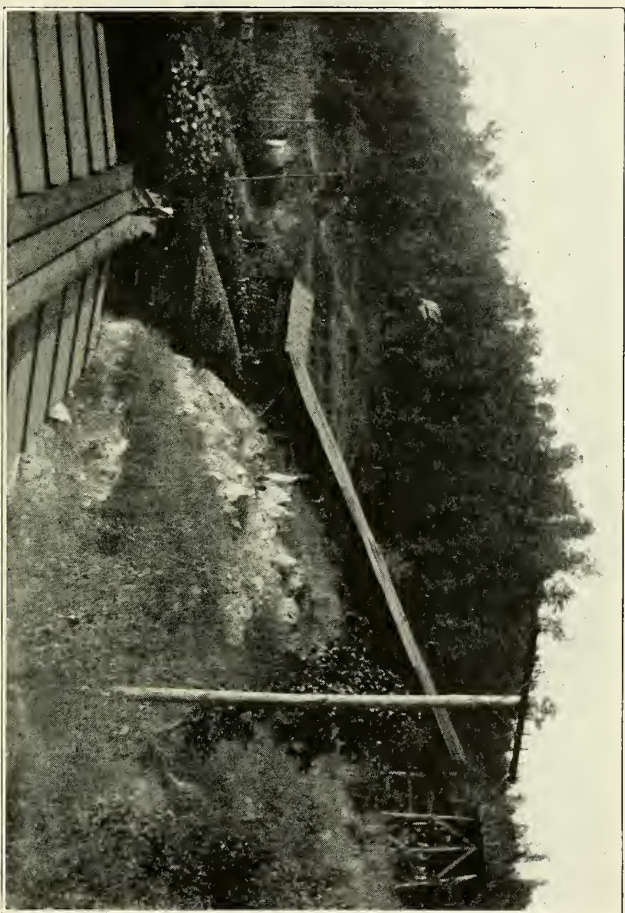


PLATE XXII.—Coal Tippie of Kenova Coal Mining Company, Branchland, Lincoln County.

The Lower Winifrede Sandstone.

Underneath the **Winifrede** coal from 2 to 5 feet, there occurs a bed of massive, gray sandstone, which has been named by Dr. I. C. White, the **Lower Winifrede**. This bed is often split up into several members of shale and sandstone, and is from 20 to 50 feet thick. This sandstone appears to be different in texture and lithographical aspect from the sandstone overlying the coal, and marks the lower portion of the Upper Kanawha series. This stratum rises above the beds of the streams in the southern part of Wayne and Lincoln counties, and is generally massive, forming cliffs along its outcrop.

The Chilton Coal.

Underlying the **Lower Winifrede sandstone** occurs a thin multiple bedded seam of coal that Dr. I. C. White has named the **Chilton coal** from its occurrence at a small mining village of that name on Davis creek, Kanawha county. The bed is impure and frequently splits into several layers of coal separated by fire clay and sandy shales.

The following section was measured at Chilton by Dr. I. C. White, and published in Volume II (A), page 430, of the West Virginia Geological Survey:

Section of Chilton Coal.

	Ft.	In.
Black band coal, (Winifrede).....		
Concealed and massive sandstone.....	70	0
Coal	0	5
Fire clay.....	2	0
Coal and clay.....	1	0

In Lincoln county, the **Chilton coal** comes above the surface near the southern boundary line in the hills along Guyandot river and its tributaries. It is impure and split with layers of slate and fire clay.

THE CHILTON COAL IN HARTS CREEK DISTRICT.

Opening No. 255 is located at Leet on Big Ugly creek and where the coal crops at edge of the stream, the following section was measured:

Section of Big Ugly Creek Coal Opening.

	Ft.	In.
Sandstone, current bedded.....		
Coal, hard.....0' 6"	1	6
Slate .....0 3		
Coal, hard.....0 9		
Slate .....2 0		
Sandstone bottom, 612' A. T. L.....		

Another opening, No. 256, $\frac{1}{2}$ mile above the mouth of Laurel creek on Big Ugly, just below an old mill, exhibits the following section:

Section of Big Ugly Creek Coal Opening.

	Ft.	In.
Sandstone		
Coal .....0' 8"	2	4
Slate .....0 10		
Coal .....0 10		
Slate, 615' A. T. B.....		

Opening No. 256 (a) is located on property of the Guyandotte Land Association along Guyandotte river, one-fourth mile west of Atenville, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

	Ft.	In.
Sandstone		
Coal .....0' 1"	1	8½
Slate .....0 ½		
Coal, block.....1 7		
Slate floor, 620' A. T. B.....		
Butts run N 40° W; faces, N 50° E.		

Opening No. 257 is located on the land of Albert Toney along Big Ugly creek, S 8° E, $2\frac{1}{2}$ miles from Leet, where the coal is mined for local fuel, and the following section was measured:

Section of Albert Toney's Coal Opening.

			Ft.	In.
(1)	Sandstone roof.....			
(2)	Coal, good.....0'	6"		
(3)	Slate	0	1	
(4)	Coal, splint.....1	0		
(5)	Slate	0	1	
(6)	Coal, block.....0	4		
(7)	Slate	0	2	
(8)	Coal, block.....0	11		
(9)	Slate, bottom, 710' A. T. B.....			

Butts run S 42° W; faces, N 48° E. Sample for analysis taken from Nos. 2, 4, 6 and 8, for results of which see table pages 404-405.

Opening No. 258 is located on the land of W. E. Fry along Nine Mile creek, $\frac{1}{2}$ mile east of Midkiff, where the coal is mined for local fuel, and the following section was measured:

Section of W. E. Fry's Coal Opening.

		Ft.	In.
	Sandstone		
	Coal, impure.....0'	8"	
	Coal, cannel, bony.....1	8	
	Fire clay.....2	0	
	Coal, visible, 600' A. T. B.....0	6	

CHILTON COAL IN LAUREL HILL DISTRICT.

Only one opening of coal (No. 259) on this seam was measured in Laurel Hill district, and it is located on the property of the Guyandotte Land Association along Guyandot river, $\frac{1}{4}$ mile west of Atenville, where the following section was measured:

Section of Guyandotte Land Association's Coal Opening.

		Ft.	In.
(1)	Sandstone, massive, roof.....		
(2)	Coal, block.....1'	1"	
(3)	Slate	0	$\frac{1}{2}$
(4)	Coal, block.....0	7	
(5)	Slate, bottom, 630' A. T. B.....		

Butts run N 40° W; faces, N 50° E. Sample for analysis taken from Nos. 2 and 4, for results of which see table pages 404-405.

The preceding sections illustrate the character and structure of the Chilton coal in the Cabell-Wayne-Lincoln

area and indicate that there is not much coal of commercial value in this bed. The analyses of the samples taken will be given in a subsequent chapter in this volume.

The Malden Sandstone.

The great sandstone mass between the Chilton and the Cedar Grove coal has been named by Dr. I. C. White, the **Malden sandstone**, since it forms a conspicuous landmark in the topography on both sides of the Kanawha river in the vicinity of Malden, Kanawha county.

Possibly this sandstone horizon can be subdivided by further study in Kanawha and adjoining counties. This horizon is split into shales and fire clays together with thin sandstone ledges in the area under discussion.

The Cedar Grove Coal.

This coal, usually found in the Kanawha series, was not exposed in the area studied.

The Campbells Creek Limestone.

At an interval from 10 to 30 feet above the Peerless coal there is often found an impure, earthy limestone that Dr. I. C. White has named the **Campbells Creek Limestone** from its occurrence at the mouth of a creek of that name in Kanawha county, 5 miles southeast of Charleston. This limestone occurs near Big creek on Limestone branch of Guyandot river, where it is about two feet thick, dark gray, and non-fossiliferous.

The Peerless Coal.

From 50 to 60 feet under the Cedar Grove coal horizon is found a small, hard block coal that was named the **Peerless** on Kanawha river, where it was first mined for commercial use. This bed is exposed in a cut of the Norfolk and Western Railroad, just south of Crumm, where the following section was measured:

Section of Crumm Coal Opening.

	Ft.	In.
Slate	1	0
Sandstone, fine grained, micaceous.....	8	0
Slate and shale.....	3	0
Coal, hard, block.....	1	6
Fire clay	1	0

This bed occurs 80 to 115 feet above the Warfield, or No. 2 Gas coal, and is possibly identical with the Alma seam that is mined along Tug river, near Williamson.

No. 2 Gas Coal (Warfield).

The next coal seam under the Peerless is probably one of the most important coal beds in West Virginia. It is variously known as the "**Campbells Creek**", "Holden", "Warfield" and "No. 2 Gas." In the market it is widely known as the "No. 2 Gas" or simply as "No. 2 Coal." This seam is more extensively mined in the Kanawha field than any other bed in the Kanawha Measures, and furnishes a greater tonnage than any other of the Kanawha seams. It contains enough hard or splint coal to make an excellent shipping fuel, while the softer and more friable layers make an excellent coke and are also valuable for gas making purposes.

In Lincoln county, the "No. 2 Gas" rises out of Guyandot river between Fry and Big Creek stations. It is mined at Big Creek in Logan county, by the Block Coal Company, successors to the Prudential Coal and Mining Company, where the following section was measured:

Section of Block Coal Company's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, hard splint.....3' 8"		
Slate .....0 ½		
Coal .....0 2		
Slate .....0 4		
Coal .....0 6		
Slate .....1 4		
Coal .....0 10		
Fire clay, 660' A. T. B.....	5	2
Butts run S 20° E; faces, N 70° E; greatest rise, S 40° E; capacity, 100 tons daily.		

This seam is mined at mouth of Tantrough branch on land of Brad Toney for local fuel, where the following section was measured:

Section of Brad Toney's Coal Opening.

	Ft.	In.
Slate and shale roof.....		
Coal, impure.....1' 3" }		
Coal, block, good.....1 7 }	2	10
Fire clay bottom, 620' A. T. L.....		

In Wayne county the No. 2 Gas seam (Warfield) rises above Tug fork just north of the Wayne-Mingo line. It is mined for local fuel at Kermit, in Mingo county. It is also mined for local fuel on the land of M. H. Walden on Marrowbone creek, where the following section was measured:

Section of W. H. Walden's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal and slate.....0' 2" }		
Coal, hard, block.....3 0 }	3	2
Slate bottom, 605' A. T. B.....		
Butts run N 40° W; faces, N 50° E; greatest rise, northwest.		

The No. 2 Gas seam was encountered in the Thomas Stepp well No. 2, drilled by the Meteor Carbon Company, one mile south of Stonecoal Station, at a depth of 65 feet, and at an elevation of 635 feet A. T. B. This coal was also encountered in the gas well at Dunlow at 300 feet below the surface and at an elevation of 380' A. T. B.

Just what area of Wayne and Lincoln counties is underlain with this coal bed in commercial thickness is difficult to determine, and before an accurate calculation can be made it will be necessary to exploit the coal more fully with the core drill. It is probable that a portion of the southern parts of both Lincoln and Wayne carries this coal in commercial thickness, but the question can only be determined definitely by sinking numerous drill holes, since the horizon of the bed is several hundred feet below water level.

CHAPTER IX.

GEOLOGIC STRUCTURE.

Methods of Representing Structure.

There are two methods that can be used in representing geologic structure. One of these is by cross sections at right angles to the line of strike. These sections show how the strata would appear if a deep ditch were dug perpendicular to the line of strike entirely across the area under discussion. This method can be used where the dip of the rocks is very heavy and is easily perceptible to the eye. In the Cabell-Wayne-Lincoln area the folds are so slight that it would not be practicable or satisfactory to use this method without gradually exaggerating the vertical scale of the cross section in comparison to the horizontal scale. This method would give only an idea of the structure along certain lines and would not give the slope of the arches or the basins, which latter feature is of very great importance in the three counties as regards the future development of its mineral resources, especially the exploitation of its oil and gas fields and the mining of its coal beds.

The second method of representing geologic structure that meets the latter conditions, consists in the representation by contour lines that indicate the elevation above tide of some particular stratum. This stratum should be one that is generally known throughout a wide exposure in outcrop, its exploitation by mines, or its general use as a key rock by the drillers for oil and gas in the region to be mapped.

In the Cabell-Wayne-Lincoln area, the writer has taken the top of the Pittsburgh coal bed as the stratum to be used as the key rock. This bed is the most widely known through-

out the area, and where it outcrops can be easily identified, as it is mined for local fuel in a great many places. Its outcrop extends over more than one-half of the area under discussion.

The altitude of the top of the Pittsburgh coal bed over a large portion of the area was determined by levels on the outcrop, but south of the center of Lincoln and Wayne counties, its horizon has passed into the air over the summits of the highest hills; hence its elevation in these portions of the area had to be determined by adding its interval in feet above some known stratum to the tidal elevation of the latter. The base of the Upper Freeport coal was used for the levels as far south as its outcrop extended, and after this stratum had passed into the air over the summits of the highest hills, the base of No. 5 Block coal was used for the levels. However, in using these several strata for the datum, a difficulty was encountered in the gradual thickening of the strata to the southeast, so that it was necessary gradually to increase this interval in the southeastward direction.

In general, these structure contours are only approximately correct, from the fact that it is assumed that over small areas the rocks maintain a uniform thickness, when it has been well established that two easily determined strata will often vary many feet in interval in a very short distance.

Another cause of error is the method of getting the elevation of the key rock. These altitudes were determined in many cases with the spirit level, but the great majority were obtained with the aneroid barometer. The aneroid was checked frequently on the spirit levels of the U. S. Geological Survey left at conspicuous points along the public highways in their preparation of the accurate map of the Cabell-Wayne-Lincoln area in the co-operation with the State of West Virginia. By this method errors were avoided as far as possible and over most of the area their sum is less than one contour interval; that is, less than 25 feet.

Detailed Geologic Structure.

The Cabell-Wayne-Lincoln area is situated in the central part of the deepest portion of the Appalachian basin or the geo-syncline which enters West Virginia near the southwest corner of Pennsylvania. The following description of this syncline or trough is given by Dr. I. C. White in Volume II, West Virginia Geological Survey, pages 84 and 85, 1903:

"The central or deepest portion of the Appalachian basin or geo-syncline enters West Virginia from Greene county, Penna., at the southwest corner of the latter State, and crossing western Monongalia and eastern Wetzel counties, continues on through the State in a general southwest course across Tyler, western Doddridge, central Ritchie, Wirt and Jackson, cutting eastern Mason and western Putnam and central Cabell to enter Kentucky from northern Wayne, ten miles from the mouth of Big Sandy river. Where the axis of this great basin enters the State and on to the southwest as far as Doddridge county at least, the Pittsburgh coal is buried to a depth of 1,300 to 1,500 feet under the highest summits, or say 100 to 150 feet above tide, but from Doddridge county on southwestward the basin begins to rise and at the Kentucky line the Pittsburgh coal overlooks the Big Sandy waters from an elevation of 800 feet above tide in the deepest portion of the trough."

The Parkersburg Syncline.

This great trough, or Parkersburg syncline, enters Cabell county from Mason and runs S 40° W, passing through Teays Valley about three miles west of Milton and crosses the Guyandot river about two miles south of Martha and the Cabell-Wayne line about one-half mile northwest of Bowen, from whence it takes a course S 83° W, crossing Twelvepole about three-fourths mile south of Dickson, entering Kentucky between the mouth of Gragston and Whites creeks, about nine miles south of Kenova. The elevation of the Pittsburgh coal bed in the eastern part of the syncline, where it crosses the Mason-Cabell line, is about 615 feet above tide, and where the syncline crosses Big Sandy river into Kentucky, the elevation of the same bed is 890 feet above tide.

There are several small but well marked folds in the Cabell-Wayne-Lincoln area between the **Parkersburg syncline**

and the **Warfield anticline** running nearly north and south, among which are the following:

Anticlines.

Doane.
Branchland.
Byrnside.

Synclines.

Queens Ridge.
Ferrellsburg.
Griffithsville.

Doane Anticline.

This anticline enters the area from the south, crossing the Mingo-Wayne line two miles west of East fork of Twelvepole, and the main Twelvepole at Doane, trending in a northern direction and passing just west of Doane Station on the N. & W. R. R. from which it was named. It passes just east of Wells Branch Station; east of Hooker Knob; west of Porter Knob; about one mile west of Kiahville P. O.; about one mile east of Cove Creek P. O., and dies out about two or three miles east of East Lynn. This anticline passes through Lincoln and Grant districts and extends well into Stonewall district, Wayne county. The Pittsburgh coal horizon would be about 1,810 feet above tide, where the crest of this arch enters the area and about 1,325 feet where it dies out at the north.

Queens Ridge Syncline.

This syncline crosses the Wayne-Mingo county line one mile and a quarter east of West fork of Twelvepole, or about half way between the East and West forks of Twelvepole, and runs in a northerly direction for about three miles, where it veers northeastwardly near Eloise P. O., and runs in this course for about three miles, crossing the East fork of Twelvepole one mile northeast of Eloise P. O., to a point near Queen Ridge P. O., from which it takes its name; thence it passes to a point near Cove Gap P. O., where it again turns to the northeast for about four miles, where it gradually dies out. It extends through Grant district and enters Stonewall district, Wayne county.

Branchland Anticline.

This anticline crosses the Logan-Lincoln county line about seven miles southwest of Big Creek P. O. and runs in a general northern direction along the Guyandot river, crossing that stream twice near Eden Park and again just west of Bolin Station, and continuing on the east side of the river to Midkiff, where it follows the general course of the river for some distance and passes just east of Branchland, extending to a point near Sheridan where it dies out. It passes through Harts Creek, Laurel Hill and Sheridan districts in Lincoln county.

Ferrellsburg Syncline.

This syncline crosses the Logan and Lincoln county line, entering the Cabell-Wayne-Lincoln area about three miles west of Big Creek Station, and runs in a general northern direction, crossing the Guyandot river just east of Ferrellsburg, from which it was named, and passes west of Leet, crossing Big Ugly creek two miles east of Gill Station, and gradually dies out at a point near Myra P. O. It passes through Harts creek, Jefferson and Carroll districts, Lincoln county.

Griffithsville Syncline.

This syncline sets in gradually about $3\frac{1}{2}$ miles south of Griffithsville and runs in a northeastern direction, crossing Sugartree fork of Middle fork of Mud river about two miles south of Griffithsville, and Straight fork of Middle fork of Mud river just east of Griffithsville. It passes about three-fourths mile east of Griffithsville, from which it takes its name, and gradually dies out about two miles northeast of that village. It passes through Union and Duval districts.

Byrnside Anticline.

This anticline enters the Cabell-Wayne-Lincoln area from the north at the corner of the three counties, Kanawha, Lin-

coln and Putnam, and runs in a southern direction, crossing Trace fork of Mud river about one mile northwest of Garretts Bend P. O., passing through Garretts Bend P. O. and gradually dies out about one or two miles south of Garretts Bend. It passes through Duval district, Lincoln county.

PART III.

The Mineral Resources of the Cabell-Wayne-Lincoln Area.

CHAPTER X.

PETROLEUM AND NATURAL GAS.

The exploitation of West Virginia for oil and gas began more than 50 years ago, with the opening of the Burning Spring field in Wirt county, yet very little work was done in the area under discussion until 1903 when the Milton pool was opened by drilling the E. W. Beckett Well No. 1, located on the Beckett farm, two miles and a half southeast of Milton. This field is located on Mud river between Charley creek and Little Two Mile creek. The Beckett well was drilled by the Cabell Oil & Gas Company. The field has never developed a large area, but is very rich in oil and gas.

The **Griffithsville oil field** in Lincoln county was first opened in 1907, when oil was found in the Serepta Workman well, drilled by the Big Creek Development Company.

The Branchland oil and gas field was opened in 1908 by the drilling in of several gas wells at Branchland. A few years previous, gas had been found at Dunlow in Wayne county.

All the oil and gas that has thus far been discovered in West Virginia has been produced from sandstone beds called "sands" by the drillers. These sands have been given various names by the oil and gas operators, which have gradually

come into use in describing the beds. The following table shows the position of the different sands in the geologic column:

The Oil and Gas Horizons of West Virginia.

Carboniferous.	Monongahela Series	Carroll sand (Uniontown).
	Conemaugh Series.....	{ Minshall (Connellsville). Murphy (Morgantown). Moundsville (Saltsburg). First Cow Run (Little Dunkard) sand (Buffalo). Big Dunkard sand (Mahoning).
	Allegheny Series.....	{ Burning Springs (Upper Freeport) sand. Gas sand (Lower Freeport).
	Pottsville Series.....	{ Gas sand of Marion and Monongalia counties, (Homewood), Second Cow Run of Ohio. Gas sand of Cairo. Salt sand of Cairo. Cairo?
	Mauch Chunk Red Shale.....	Maxton, Dawson, Cairo.
	Greenbrier Limestone "Big Lime";	not generally productive.
Devonian.	Pocono Sandstones	{ Keener sand and Beckett sand of Milton. Big Injun sand. Squaw sand. Berea Grit.
	Catskill Red Beds.....	{ Gantz sand. Fifty-foot sand. Thirty-foot sand. Stray sand. Gordon sand. Fourth sand. McDonald or Fifth sand. Bayard or Sixth sand.
	Chemung and Portage Beds...	{ Warren First or Second Tiona, Speechley sand. No well defined oil or gas horizons yet discovered in West Virginia.

In the Cabell-Wayne-Lincoln area the first producing sand that has been thus far discovered is the Salt sand in the Pottsville series. The Big Lime, Beckett, Big Injun and Berea are also producing sands.

The interval of these sands below the top of the Pittsburgh coal varies considerably between the northern portion of the area and the southern, owing to the fact that the measures thicken rapidly to the southeast.

The top of the Pittsburgh coal is used as the "key rock" in the structural map of the area, and the following table gives a general idea of the sequence or order of the beds and the approximate interval from the Pittsburgh coal horizon down to the top of the different sands in the three counties:

Approximate Intervals from the Pittsburgh Coal to Top of Oil and Gas Sands.

SANDS.	INTERVALS BELOW PITTSBURGH COAL.
	Feet.
Salt sand	1200 — 1400
Big Lime	1450 — 2250
Beckett	1550 — 2270
Big Injun	1600 — 2400
Berea	2150 — 3000

The above intervals are only approximate and give a general idea in regard to the rapid thickening of the strata from the northern to the southern part of the area.

DESCRIPTION OF SANDS.

The first productive sand in the area under discussion is the **Salt sand**. The top of this sand lies from 1,200 to 1,400 feet below the horizon of the Pittsburgh coal in northern Lincoln county on Turkey creek, Duval district, where the sand is rich in gas. The thickness of the sand throughout that part of Lincoln county is 550 to 600 feet, but usually only the top of it for 40 to 60 feet is "pay."

The following record of the G. W. Byrnside well No. 3 (L-3) on the Right fork of Turkey creek, Duval district, Lincoln county, and drilled by the Holly Oil and Development Company, gives the location of this sand:

Byrnside Well No. 3.

	Thickness. Feet.	Total. Feet.
Conductor	23	23
Slate	22	45
Red rock	10	55
Slate and shells.....	80	135
Slate	40	175
Sand	5	180
Slate	40	220
Sand	70	290
Slate	80	370
Sand	65	435
Slate	20	455
Sand	40	495
Slate	10	505
Sand	45	550
Slate	100	650
Sand	90	740
Slate	10	750
Coal	3	753
Slate	110	863
Limestone	35	898
Sand; 1st pay, gas, 918'.....	20	918
Sand, gas, 942'.....	24	942
Sand, gas, 963'.....	21	963
Total depth of well.....		963
Volume, 1,360,000 cu. ft.; rock pressure, 350 lbs.		

The G. W. Byrnside well No. 1 (L-4), located S 46° W, $\frac{3}{4}$ mile from the Byrnside well No. 3, given on the preceding page, drilled by the Holly Oil & Development Company, shows the following record:

G. W. Byrnside Well No. 1.

	Thickness. Feet.	Total. Feet.
Unrecorded	15	15
Slate	155	170
Sand	60	230
Slate	25	255
Sand	110	365
Slate	5	370
Sand	40	410
Slate	5	415
Sand	65	480
Slate	115	595
Sand	80	675
Slate, gas, 733'.....	73	748
Sand, gas and water, 748'.....	15	763
Slate	47	810
Lime	5	815



PLATE XXIII.—Shooting the Octavia Hager Well No. 5, in the Griffithsville Oil Field.

	Thickness Feet.	Total Feet.
Sand, first large gas flow, 880'.....	65	880
Sand	20	900
Sand, second large gas flow, 900'.....	21	921
Sand, third large gas flow, 921.....	9	930
Sand, salt water, 930'.....	60	990
Slate	35	1025
Sand	381	1406
Big Lime	226	1632
Slate	10	1642
Big Injun sand	25	1667
Slate and shells.....	33	1700
Slate	413	2113
Berea Grit , gas, 2116'.....	24	2137
Slate to bottom.....	8	2145
Rock pressure, Berea, 410 lbs.; gas sand, 360 lbs.; volume, Berea Grit, 492,000 cu. ft.; volume in gas sand, 8,593,000 cu. ft.		

The Big Lime.

The Big Lime, known as the **Mountain** or **Greenbrier Limestone**, is persistent in the area under discussion and varies in thickness from 135 to 225 feet. This "sand" produces gas and also oil in Sheridan district, Lincoln county. The "pay" appears to be about 100 feet from the top of the stratum.

The following is a record of Guyan well No. 5 (L-50-a) drilled by the Guyan Oil Company, located on Lick branch of Fourmile creek, Sheridan district, Lincoln county; elevation of casing head, 671' A. T. L.:

Guyan Well No. 5.	Thickness. Feet.	Total. Feet.
Unrecorded	70	70
Coal	2	72
Unrecorded	534	606
Salt sand	324	930
Unrecorded	100	1030
Little Lime	8	1038
Unrecorded	22	1060
Pencil cave	6	1066
Unrecorded	19	1085
Big Lime , oil pay, 1200'-1210'.....	143	1228
Total depth		1228
Well completed October 6, 1907; first day's production, 18 bbls.; average daily production for one year, 5.82 bbls.		

The above record shows the top of the pay 115 feet below the top of the Big Lime.

Another well located in Sheridan district, Lincoln county, on Twomile creek, east of Branchland, drilled by the Hamlin Oil Company, has the following record:

Lincoln Well No. 19 (E. Sanson).

	Thickness. Feet.	Total. Feet.
Unrecorded	1045	1045
Salt sand	150	1195
Unrecorded	361	1556
Little Lime	15	1571
Pencil cave	3	1574
Big Lime, oil, 1662' and 1667'.....	122	1696
First day's production, 20 bbls.		

The "pay" in the above section is 88 feet below the top of the Big Lime.

One peculiarity appears in that the oil is found in the lime when the top of the lime is the highest, or in other words on the **anticline**, instead of the syncline.

The Beckett Sand.

This sand occurs just underneath the Big Lime in the Milton field, Cabell county, and is possibly a portion of the Big Lime. It was named the **Beckett sand** by Dr. I. C. White from its occurrence in the E. W. Beckett well No. 1, among the first wells drilled in that field. This sand is from 10 to 20 feet thick and produces a dark, heavy oil, very much like the Big Lime oil in Lincoln county.

In the Beckett well No. 1, the top of this sand occurs 115 feet below the top of the Big Lime, and is 15 feet thick with lime and sand underneath same.

The Big Lime is usually 140 to 185 feet thick, and it is possible that this sand really is an impure part of the lower portion of the Big Lime.

The Big Injun Sand.

The Big Injun sand is easily identified in the Cabell-Wayne-Lincoln area, since it comes directly underneath the Big Lime (except in the Milton oil field where the Beckett sand divides them). In the northern part of West Virginia the Big Injun sand often attains a thickness of 150 to 200 feet. In the area under discussion this sand rarely reaches a thickness of 80 feet. Generally it is from 30 to 50 feet thick. This sand produces gas in the Branchland field in Lincoln county.

The Berea Sand.

One of the most important sands in the Cabell-Wayne-Lincoln area is the **Berea sand** which comes 650 to 750 feet below the top of the Big Lime. It ranges in thickness from 20 to 25 feet, and is the great oil producing stratum in the Griffithsville, Lincoln county, field. It also produces gas in the Milton field in Cabell county. In the area under discussion this stratum is a grayish white, fine grained sandstone, and has not produced and very large oil wells, but the wells that have been producing for four and five years still yield nearly the same monthly production that they did when first drilled.

OIL AND GAS DEVELOPMENT IN THE CABELL-WAYNE-LINCOLN AREA.

EARLY HISTORY.

Prospecting for oil and gas in the Cabell-Wayne-Lincoln area has been carried on to a small extent for many years; however no oil or gas of commercial value was found until the Milton field in Cabell county was discovered about 10 years ago. A few years later the Griffithsville and Branchland fields in Lincoln county were discovered. Gas in commercial quantity has also been discovered in Wayne county within the past ten years, and several wells have been drilled in the past three years.

CABELL COUNTY WELL RECORDS.

The only source of information as to the character and thickness of the several formations of economic interest where they lie deeply buried below drainage is the logs of the numerous borings that have been sunk for oil and gas over the area of the three counties both by individuals and corporations. Through their courtesy the writer has been enabled to collect the logs of a large number of wells, on most of which levels were taken in the field while gathering data for this report. Quite a number of these records are very meagre in that fre-

quently only the principal oil and gas horizons and sometimes one or more coal beds are recorded. The Pittsburgh coal bed, the great "key rock" of the oil fields in the northern end of the State, is quite generally absent in Cabell, Wayne and Lincoln counties, and for this reason the drillers have considerable trouble to identify the sands above the Big Lime, the latter being the best "key rock" of the area. The importance from a scientific standpoint, of keeping accurate and detailed logs of all strata passed through cannot be overestimated. It is of special importance that the exact depth and thickness of the horizon be noted at which oil, gas and water are encountered; also the position, thickness and character of all coals, red beds, limestones, sandstones and dark slates. In the preface to Volume 1 (A) of the W. Va. Geological Survey reports, I. C. White has the following to say concerning the importance and value of such records:

"The geologic data thus given to the citizens of our domain practically free of expense, has cost the operators millions of dollars to secure, in their fruitful search with the drill. That they will spend many millions more in piercing the rocky envelope of the State for these treasures of light and fuel goes without saying. The writer has endeavored to enlist the aid of the Carnegie Institute of Washington, D. C., in an effort to secure more carefully kept records rendered available to geology through this enormous expenditure of money in drilling for oil and gas in West Virginia, but as yet the officers of that Institution have failed to embrace this opportunity to add so immensely to the sum of human knowledge at only a small outlay in money. The great oil-producing companies would most heartily cooperate in any such endeavor by giving facilities for securing samples of the drillings, making more numerous and accurate (steel line) measurements, etc.; but they cannot be expected to do such purely scientific work at their own expense and entirely on their own initiative.

"If the Survey could secure funds to employ two men at modest salaries (\$60 to \$75 per month), one to attend the drill by day and the other by night, recording measurements and securing samples from every sand pumping, the results thus obtained would prove of the greatest value, especially in the distant future of the State, when the search for oil and gas shall have long been ended in their exhaustion, and a knowledge of the State's deeply buried coal resources shall prove of great value to her citizens. It is hoped that some means of securing and preserving such valuable data now rendered possible in so many counties may soon be obtained before the enormous expenditures required in drilling operations shall have ended forever."

The accompanying table contains the abbreviated records of over 80 wells in Cabell county and the tidal elevations of several other wells, where the records could not be obtained

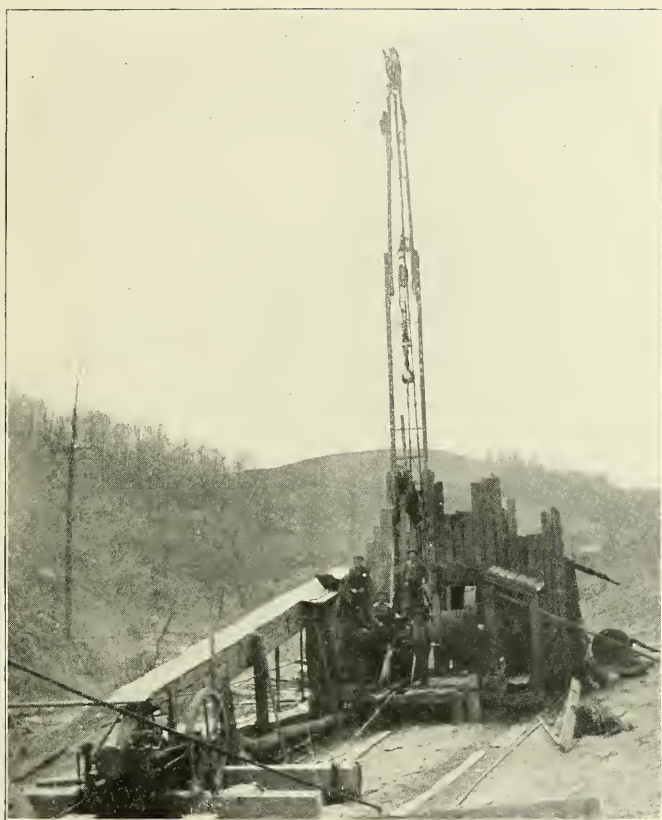


PLATE XXIV.--Drilling Well of Columbia Gas & Electric Company, Patent Drilling Machinery, Branchland, Lincoln County.

Section of Crumm Coal Opening.

	Ft.	In.
Slate	1	0
Sandstone, fine grained, micaceous.....	8	0
Slate and shale.....	3	0
Coal, hard, block.....	1	6
Fire clay	1	0

This bed occurs 80 to 115 feet above the Warfield, or No. 2 Gas coal, and is possibly identical with the Alma seam that is mined along Tug river, near Williamson.

No. 2 Gas Coal (Warfield).

The next coal seam under the Peerless is probably one of the most important coal beds in West Virginia. It is variously known as the "Campbells Creek", "Holden", "Warfield" and "No. 2 Gas." In the market it is widely known as the "No. 2 Gas" or simply as "No. 2 Coal." This seam is more extensively mined in the Kanawha field than any other bed in the Kanawha Measures, and furnishes a greater tonnage than any other of the Kanawha seams. It contains enough hard or splint coal to make an excellent shipping fuel, while the softer and more friable layers make an excellent coke and are also valuable for gas making purposes.

In Lincoln county, the "No. 2 Gas" rises out of Guyandot river between Fry and Big Creek stations. It is mined at Big Creek in Logan county, by the Block Coal Company, successors to the Prudential Coal and Mining Company, where the following section was measured:

Section of Block Coal Company's Coal Opening.

	Ft.	In.
Slate roof.....		
Coal, hard splint.....3' 8"		
Slate .....0 ½	6	10½
Coal .....0 2		
Slate .....0 4		
Coal .....0 6		
Slate .....1 4		
Coal .....0 10		
Fire clay, 660' A. T. B.....	5	2
Butts run S 20° E; faces, N 70° E; greatest rise, S 40° E; capacity, 100 tons daily.		

This seam is mined at mouth of Tantrough branch on land of Brad Toney for local fuel, where the following section was measured:

Section of Brad Toney's Coal Opening.

	Ft.	In.
Slate and shale roof.....		
Coal, impure.....1' 3" }		
Coal, block, good.....1 7 }	2	10
Fire clay bottom, 620' A. T. L.....		

In Wayne county the No. 2 Gas seam (Warfield) rises above Tug fork just north of the Wayne-Mingo line. It is mined for local fuel at Kermit, in Mingo county. It is also mined for local fuel on the land of M. H. Walden on Marrowbone creek, where the following section was measured:

Section of W. H. Walden's Coal Opening.

	Ft.	In.
Sandstone roof.....		
Coal and slate.....0' 2" }		
Coal, hard, block.....3 0 }	3	2
Slate bottom, 605' A. T. B.....		
Butts run N 40° W; faces, N 50° E; greatest rise, northwest.		

The No. 2 Gas seam was encountered in the Thomas Stepp well No. 2, drilled by the Meteor Carbon Company, one mile south of Stonecoal Station, at a depth of 65 feet, and at an elevation of 635 feet A. T. B. This coal was also encountered in the gas well at Dunlow at 300 feet below the surface and at an elevation of 380' A. T. B.

Just what area of Wayne and Lincoln counties is underlain with this coal bed in commercial thickness is difficult to determine, and before an accurate calculation can be made it will be necessary to exploit the coal more fully with the core drill. It is probable that a portion of the southern parts of both Lincoln and Wayne carries this coal in commercial thickness, but the question can only be determined definitely by sinking numerous drill holes, since the horizon of the bed is several hundred feet below water level.

CHAPTER IX.

GEOLOGIC STRUCTURE.

Methods of Representing Structure.

There are two methods that can be used in representing geologic structure. One of these is by cross sections at right angles to the line of strike. These sections show how the strata would appear if a deep ditch were dug perpendicular to the line of strike entirely across the area under discussion. This method can be used where the dip of the rocks is very heavy and is easily perceptible to the eye. In the Cabell-Wayne-Lincoln area the folds are so slight that it would not be practicable or satisfactory to use this method without gradually exaggerating the vertical scale of the cross section in comparison to the horizontal scale. This method would give only an idea of the structure along certain lines and would not give the slope of the arches or the basins, which latter feature is of very great importance in the three counties as regards the future development of its mineral resources, especially the exploitation of its oil and gas fields and the mining of its coal beds.

The second method of representing geologic structure that meets the latter conditions, consists in the representation by contour lines that indicate the elevation above tide of some particular stratum. This stratum should be one that is generally known throughout a wide exposure in outcrop, its exploitation by mines, or its general use as a key rock by the drillers for oil and gas in the region to be mapped.

In the Cabell-Wayne-Lincoln area, the writer has taken the top of the Pittsburgh coal bed as the stratum to be used as the key rock. This bed is the most widely known through-

out the area, and where it outcrops can be easily identified, as it is mined for local fuel in a great many places. Its outcrop extends over more than one-half of the area under discussion.

The altitude of the top of the Pittsburgh coal bed over a large portion of the area was determined by levels on the outcrop, but south of the center of Lincoln and Wayne counties, its horizon has passed into the air over the summits of the highest hills; hence its elevation in these portions of the area had to be determined by adding its interval in feet above some known stratum to the tidal elevation of the latter. The base of the Upper Freeport coal was used for the levels as far south as its outcrop extended, and after this stratum had passed into the air over the summits of the highest hills, the base of No. 5 Block coal was used for the levels. However, in using these several strata for the datum, a difficulty was encountered in the gradual thickening of the strata to the southeast, so that it was necessary gradually to increase this interval in the southeastward direction.

In general, these structure contours are only approximately correct, from the fact that it is assumed that over small areas the rocks maintain a uniform thickness, when it has been well established that two easily determined strata will often vary many feet in interval in a very short distance.

Another cause of error is the method of getting the elevation of the key rock. These altitudes were determined in many cases with the spirit level, but the great majority were obtained with the aneroid barometer. The aneroid was checked frequently on the spirit levels of the U. S. Geological Survey left at conspicuous points along the public highways in their preparation of the accurate map of the Cabell-Wayne-Lincoln area in the co-operation with the State of West Virginia. By this method errors were avoided as far as possible and over most of the area their sum is less than one contour interval; that is, less than 25 feet.

Detailed Geologic Structure.

The Cabell-Wayne-Lincoln area is situated in the central part of the deepest portion of the Appalachian basin or the geo-syncline which enters West Virginia near the southwest corner of Pennsylvania. The following description of this syncline or trough is given by Dr. I. C. White in Volume II, West Virginia Geological Survey, pages 84 and 85, 1903:

"The central or deepest portion of the Appalachian basin or geo-syncline enters West Virginia from Greene county, Penna., at the southwest corner of the latter State, and crossing western Monongalia and eastern Wetzel counties, continues on through the State in a general southwest course across Tyler, western Doddridge, central Ritchie, Wirt and Jackson, cutting eastern Mason and western Putnam and central Cabell to enter Kentucky from northern Wayne, ten miles from the mouth of Big Sandy river. Where the axis of this great basin enters the State and on to the southwest as far as Doddridge county at least, the Pittsburgh coal is buried to a depth of 1,300 to 1,500 feet under the highest summits, or say 100 to 150 feet above tide, but from Doddridge county on southwestward the basin begins to rise and at the Kentucky line the Pittsburgh coal overlooks the Big Sandy waters from an elevation of 800 feet above tide in the deepest portion of the trough."

The Parkersburg Syncline.

This great trough, or Parkersburg syncline, enters Cabell county from Mason and runs S 40° W, passing through Teays Valley about three miles west of Milton and crosses the Guyandot river about two miles south of Martha and the Cabell-Wayne line about one-half mile northwest of Bowen, from whence it takes a course S 83° W, crossing Twelvepole about three-fourths mile south of Dickson, entering Kentucky between the mouth of Gragston and Whites creeks, about nine miles south of Kenova. The elevation of the Pittsburgh coal bed in the eastern part of the syncline, where it crosses the Mason-Cabell line, is about 615 feet above tide, and where the syncline crosses Big Sandy river into Kentucky, the elevation of the same bed is 890 feet above tide.

There are several small but well marked folds in the Cabell-Wayne-Lincoln area between the **Parkersburg syncline**

and the **Warfield anticline** running nearly north and south, among which are the following:

Anticlines.

Doane.

Branchland.

Byrnside.

Synclines.

Queens Ridge.

Ferrellsburg.

Griffithsville.

Doane Anticline.

This anticline enters the area from the south, crossing the Mingo-Wayne line two miles west of East fork of Twelvepole, and the main Twelvepole at Doane, trending in a northern direction and passing just west of Doane Station on the N. & W. R. R. from which it was named. It passes just east of Wells Branch Station; east of Hooker Knob; west of Porter Knob; about one mile west of Kiahville P. O.; about one mile east of Cove Creek P. O., and dies out about two or three miles east of East Lynn. This anticline passes through Lincoln and Grant districts and extends well into Stonewall district, Wayne county. The Pittsburgh coal horizon would be about 1,810 feet above tide, where the crest of this arch enters the area and about 1,325 feet where it dies out at the north.

Queens Ridge Syncline.

This syncline crosses the Wayne-Mingo county line one mile and a quarter east of West fork of Twelvepole, or about half way between the East and West forks of Twelvepole, and runs in a northerly direction for about three miles, where it veers northeastwardly near Eloise P. O., and runs in this course for about three miles, crossing the East fork of Twelvepole one mile northeast of Eloise P. O., to a point near Queen Ridge P. O., from which it takes its name; thence it passes to a point near Cove Gap P. O., where it again turns to the northeast for about four miles, where it gradually dies out. It extends through Grant district and enters Stonewall district, Wayne county.

Branchland Anticline.

This anticline crosses the Logan-Lincoln county line about seven miles southwest of Big Creek P. O. and runs in a general northern direction along the Guyandot river, crossing that stream twice near Eden Park and again just west of Bolin Station, and continuing on the east side of the river to Midkiff, where it follows the general course of the river for some distance and passes just east of Branchland, extending to a point near Sheridan where it dies out. It passes through Harts Creek, Laurel Hill and Sheridan districts in Lincoln county.

Ferrellsburg Syncline.

This syncline crosses the Logan and Lincoln county line, entering the Cabell-Wayne-Lincoln area about three miles west of Big Creek Station, and runs in a general northern direction, crossing the Guyandot river just east of Ferrellsburg, from which it was named, and passes west of Leet, crossing Big Ugly creek two miles east of Gill Station, and gradually dies out at a point near Myra P. O. It passes through Harts creek, Jefferson and Carroll districts, Lincoln county.

Griffithsville Syncline.

This syncline sets in gradually about $3\frac{1}{2}$ miles south of Griffithsville and runs in a northeastern direction, crossing Sugartree fork of Middle fork of Mud river about two miles south of Griffithsville, and Straight fork of Middle fork of Mud river just east of Griffithsville. It passes about three-fourths mile east of Griffithsville, from which it takes its name, and gradually dies out about two miles northeast of that village. It passes through Union and Duval districts.

Byrnside Anticline.

This anticline enters the Cabell-Wayne-Lincoln area from the north at the corner of the three counties, Kanawha, Lin-

coln and Putnam, and runs in a southern direction, crossing Trace fork of Mud river about one mile northwest of Garretts Bend P. O., passing through Garretts Bend P. O. and gradually dies out about one or two miles south of Garretts Bend. It passes through Duval district, Lincoln county.

PART III.

The Mineral Resources of the Cabell-Wayne-Lincoln Area.

CHAPTER X.

PETROLEUM AND NATURAL GAS.

The exploitation of West Virginia for oil and gas began more than 50 years ago; with the opening of the Burning Spring field in Wirt county, yet very little work was done in the area under discussion until 1903 when the Milton pool was opened by drilling the E. W. Beckett Well No. 1, located on the Beckett farm, two miles and a half southeast of Milton. This field is located on Mud river between Charley creek and Little Two Mile creek. The Beckett well was drilled by the Cabell Oil & Gas Company. The field has never developed a large area, but is very rich in oil and gas.

The **Griffithsville oil field** in Lincoln county was first opened in 1907, when oil was found in the Serepta Workman well, drilled by the Big Creek Development Company.

The Branchland oil and gas field was opened in 1908 by the drilling in of several gas wells at Branchland. A few years previous, gas had been found at Dunlow in Wayne county.

All the oil and gas that has thus far been discovered in West Virginia has been produced from sandstone beds called "sands" by the drillers. These sands have been given various names by the oil and gas operators, which have gradually

come into use in describing the beds. The following table shows the position of the different sands in the geologic column:

The Oil and Gas Horizons of West Virginia.

Carboniferous.	Monongahela Series	Carroll sand (Uniontown).
	Conemaugh Series.....	{ Minshall (Connellsville). Murphy (Morgantown). Moundsville (Saltsburg). First Cow Run (Little Dunkard) sand (Buffalo). Big Dunkard sand (Mahoning).
	Allegheny Series.....	{ Burning Springs (Upper Free- port) sand. Gas sand (Lower Freeport).
	Pottsville Series.....	{ Gas sand of Marion and Monon- galia counties, (Homewood), Second Cow Run of Ohio. Gas sand of Cairo. Salt sand of Cairo. Cairo?
	Mauch Chunk Red Shale.....	Maxton, Dawson, Cairo.
	Greenbrier Limestone "Big Lime";	not generally productive.
Devonian.	Pocono Sandstones	{ Keener sand and Beckett sand of Milton. Big Injun sand. Squaw sand. Berea Grit.
	Catskill Red Beds.....	{ Gantz sand. Fifty-foot sand. Thirty-foot sand. Stray sand. Gordon sand. Fourth sand. McDonald or Fifth sand. Bayard or Sixth sand.
	Chemung and Portage Beds...	{ Warren First or Second Tiona, Speechley sand. No well de- fined oil or gas horizons yet discovered in West Virginia.

In the Cabell-Wayne-Lincoln area the first producing sand that has been thus far discovered is the Salt sand in the Pottsville series. The Big Lime, Beckett, Big Injun and Berea are also producing sands.

The interval of these sands below the top of the Pittsburgh coal varies considerably between the northern portion of the area and the southern, owing to the fact that the measures thicken rapidly to the southeast.

The top of the Pittsburgh coal is used as the "key rock" in the structural map of the area, and the following table gives a general idea of the sequence or order of the beds and the approximate interval from the Pittsburgh coal horizon down to the top of the different sands in the three counties:

Approximate Intervals from the Pittsburgh Coal to Top of Oil and Gas Sands.

SANDS.	INTERVALS BELOW PITTSBURGH COAL.	
	Feet.	
Salt sand	1200	— 1400
Big Lime	1450	— 2250
Beckett	1550	— 2270
Big Injun	1600	— 2400
Berea	2150	— 3000

The above intervals are only approximate and give a general idea in regard to the rapid thickening of the strata from the northern to the southern part of the area.

DESCRIPTION OF SANDS.

The first productive sand in the area under discussion is the **Salt sand**. The top of this sand lies from 1,200 to 1,400 feet below the horizon of the Pittsburgh coal in northern Lincoln county on Turkey creek, Duval district, where the sand is rich in gas. The thickness of the sand throughout that part of Lincoln county is 550 to 600 feet, but usually only the top of it for 40 to 60 feet is "pay."

The following record of the G. W. Byrnside well No. 3 (L-3) on the Right fork of Turkey creek, Duval district, Lincoln county, and drilled by the Holly Oil and Development Company, gives the location of this sand:

Byrnside Well No. 3.

	Thickness. Feet.	Total. Feet.
Conductor	23	23
Slate	22	45
Red rock	10	55
Slate and shells.....	80	135
Slate	40	175
Sand	5	180
Slate	40	220
Sand	70	290
Slate	80	370
Sand	65	435
Slate	20	455
Sand	40	495
Slate	10	505
Sand	45	550
Slate	100	650
Sand	90	740
Slate	10	750
Coal	3	753
Slate	110	863
Limestone	35	898
Sand; 1st pay, gas, 918'.....	20	918
Sand, gas, 942'.....	24	942
Sand, gas, 963'.....	21	963
Total depth of well.....		963
Volume, 1,360,000 cu. ft.; rock pressure, 350 lbs.		

The G. W. Byrnside well No. 1 (L-4), located S 46° W, $\frac{3}{4}$ mile from the Byrnside well No. 3, given on the preceding page, drilled by the Holly Oil & Development Company, shows the following record:

G. W. Byrnside Well No. 1.

	Thickness. Feet.	Total. Feet.
Unrecorded	15	15
Slate	155	170
Sand	60	230
Slate	25	255
Sand	110	365
Slate	5	370
Sand	40	410
Slate	5	415
Sand	65	480
Slate	115	595
Sand	80	675
Slate, gas, 733'.....	73	748
Sand, gas and water, 748'.....	15	763
Slate	47	810
Lime	5	815



PLATE XXIII.—Shooting the Octavia Hager Well No. 5, in the Griffithsville Oil Field.

	Thickness Feet.	Total Feet.
Sand, first large gas flow, 880'.....	65	880
Sand	20	900
Sand, second large gas flow, 900'.....	21	921
Sand, third large gas flow, 921.....	9	930
Sand, salt water, 930'.....	60	990
Slate	35	1025
Sand	381	1406
Big Lime	226	1632
Slate	10	1642
Big Injun sand	25	1667
Slate and shells.....	33	1700
Slate	413	2113
Berea Grit, gas, 2116'	24	2137
Slate to bottom.....	8	2145
Rock pressure, Berea, 410 lbs.; gas sand, 360 lbs.; volume, Berea Grit, 492,000 cu. ft.; volume in gas sand, 8,593,000 cu. ft.		

The Big Lime.

The Big Lime, known as the **Mountain** or **Greenbrier Limestone**, is persistent in the area under discussion and varies in thickness from 135 to 225 feet. This "sand" produces gas and also oil in Sheridan district, Lincoln county. The "pay" appears to be about 100 feet from the top of the stratum.

The following is a record of Guyan well No. 5 (L-50-a) drilled by the Guyan Oil Company, located on Lick branch of Fourmile creek, Sheridan district, Lincoln county; elevation of casing head, 671' A. T. L.:

Guyan Well No. 5.	Thickness. Feet.	Total. Feet.
Unrecorded	70	70
Coal	2	72
Unrecorded	534	606
Salt sand	324	930
Unrecorded	100	1030
Little Lime	8	1038
Unrecorded	22	1060
Pencil cave	6	1066
Unrecorded	19	1085
Big Lime, oil pay, 1200'-1210'	143	1228
Total depth		1228
Well completed October 6, 1907; first day's production, 18 bbls.; average daily production for one year, 5.82 bbls.		

The above record shows the top of the pay 115 feet below the top of the Big Lime.

Another well located in Sheridan district, Lincoln county, on Twomile creek, east of Branchland, drilled by the Hamlin Oil Company, has the following record:

Lincoln Well No. 19 (E. Sanson).

	Thickness. Feet.	Total. Feet.
Unrecorded	1045	1045
Salt sand	150	1195
Unrecorded	361	1556
Little Lime	15	1571
Pencil cave	3	1574
Big Lime, oil, 1662' and 1667'	122	1696
First day's production, 20 bbls.		

The "pay" in the above section is 88 feet below the top of the Big Lime.

One peculiarity appears in that the oil is found in the lime when the top of the lime is the highest, or in other words on the **anticline**, instead of the **syncline**.

The Beckett Sand.

This sand occurs just underneath the Big Lime in the Milton field, Cabell county, and is possibly a portion of the Big Lime. It was named the **Beckett sand** by Dr. I. C. White from its occurrence in the E. W. Beckett well No. 1, among the first wells drilled in that field. This sand is from 10 to 20 feet thick and produces a dark, heavy oil, very much like the Big Lime oil in Lincoln county.

In the Beckett well No. 1, the top of this sand occurs 115 feet below the top of the Big Lime, and is 15 feet thick with lime and sand underneath same.

The Big Lime is usually 140 to 185 feet thick, and it is possible that this sand really is an impure part of the lower portion of the Big Lime.

The Big Injun Sand.

The Big Injun sand is easily identified in the Cabell-Wayne-Lincoln area, since it comes directly underneath the Big Lime (except in the Milton oil field where the Beckett sand divides them). In the northern part of West Virginia the Big Injun sand often attains a thickness of 150 to 200 feet. In the area under discussion this sand rarely reaches a thickness of 80 feet. Generally it is from 30 to 50 feet thick. This sand produces gas in the Branchland field in Lincoln county.

The Berea Sand.

One of the most important sands in the Cabell-Wayne-Lincoln area is the **Berea sand** which comes 650 to 750 feet below the top of the Big Lime. It ranges in thickness from 20 to 25 feet, and is the great oil producing stratum in the Griffithsville, Lincoln county, field. It also produces gas in the Milton field in Cabell county. In the area under discussion this stratum is a grayish white, fine grained sandstone, and has not produced and very large oil wells, but the wells that have been producing for four and five years still yield nearly the same monthly production that they did when first drilled.

OIL AND GAS DEVELOPMENT IN THE CABELL-WAYNE-LINCOLN AREA.

EARLY HISTORY.

Prospecting for oil and gas in the Cabell-Wayne-Lincoln area has been carried on to a small extent for many years; however no oil or gas of commercial value was found until the Milton field in Cabell county was discovered about 10 years ago. A few years later the Griffithsville and Branchland fields in Lincoln county were discovered. Gas in commercial quantity has also been discovered in Wayne county within the past ten years, and several wells have been drilled in the past three years.

CABELL COUNTY WELL RECORDS.

The only source of information as to the character and thickness of the several formations of economic interest where they lie deeply buried below drainage is the logs of the numerous borings that have been sunk for oil and gas over the area of the three counties both by individuals and corporations. Through their courtesy the writer has been enabled to collect the logs of a large number of wells, on most of which levels were taken in the field while gathering data for this report. Quite a number of these records are very meagre in that fre-

quently only the principal oil and gas horizons and sometimes one or more coal beds are recorded. The Pittsburgh coal bed, the great "key rock" of the oil fields in the northern end of the State, is quite generally absent in Cabell, Wayne and Lincoln counties, and for this reason the drillers have considerable trouble to identify the sands above the Big Lime, the latter being the best "key rock" of the area. The importance from a scientific standpoint, of keeping accurate and detailed logs of all strata passed through cannot be overestimated. It is of special importance that the exact depth and thickness of the horizon be noted at which oil, gas and water are encountered; also the position, thickness and character of all coals, red beds, limestones, sandstones and dark slates. In the preface to Volume 1 (A) of the W. Va. Geological Survey reports, I. C. White has the following to say concerning the importance and value of such records:

"The geologic data thus given to the citizens of our domain practically free of expense, has cost the operators millions of dollars to secure, in their fruitful search with the drill. That they will spend many millions more in piercing the rocky envelope of the State for these treasures of light and fuel goes without saying. The writer has endeavored to enlist the aid of the Carnegie Institute of Washington, D. C., in an effort to secure more carefully kept records rendered available to geology through this enormous expenditure of money in drilling for oil and gas in West Virginia, but as yet the officers of that Institution have failed to embrace this opportunity to add so immensely to the sum of human knowledge at only a small outlay in money. The great oil-producing companies would most heartily co-operate in any such endeavor by giving facilities for securing samples of the drillings, making more numerous and accurate (steel line) measurements, etc.; but they cannot be expected to do such purely scientific work at their own expense and entirely on their own initiative.

"If the Survey could secure funds to employ two men at modest salaries (\$60 to \$75 per month), one to attend the drill by day and the other by night, recording measurements and securing samples from every sand pumping, the results thus obtained would prove of the greatest value, especially in the distant future of the State, when the search for oil and gas shall have long been ended in their exhaustion, and a knowledge of the State's deeply buried coal resources shall prove of great value to her citizens. It is hoped that some means of securing and preserving such valuable data now rendered possible in so many counties may soon be obtained before the enormous expenditures required in drilling operations shall have ended forever."

The accompanying table contains the abbreviated records of over 80 wells in Cabell county and the tidal elevations of several other wells, where the records could not be obtained

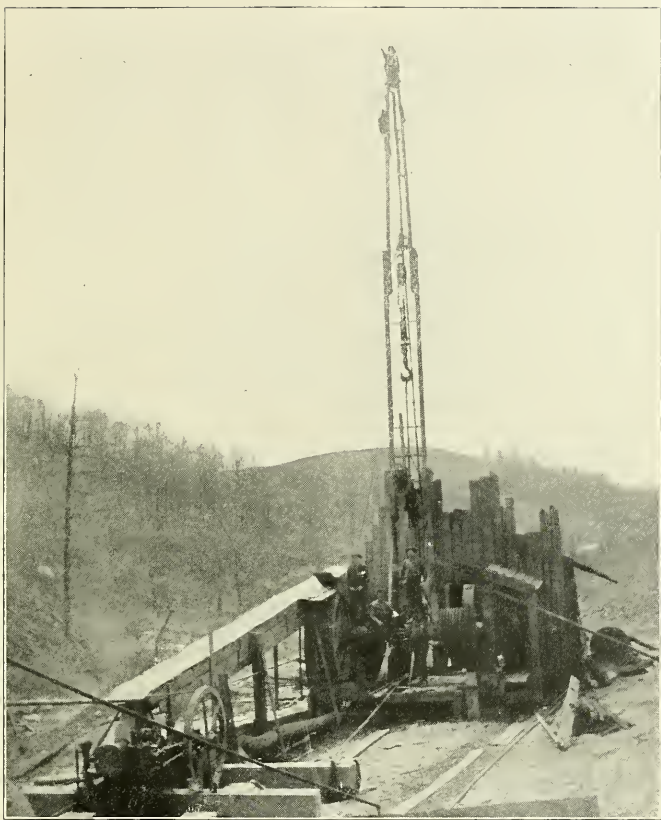


PLATE XXIV.—Drilling Well of Columbia Gas & Electric Company, Patent Drilling Machinery, Branchland, Lincoln County.

by the writer at this time. These wells are numbered consecutively from 1 up to 149 and grouped by magisterial districts, the serial number in each case corresponding to the number of the same well on the economic geology map accompanying this report in a separate cover. Similar tables are found on subsequent pages for Lincoln and Wayne counties, and generally where one of these tabulated wells is mentioned in the body of the text, the serial number of the well along with the initial letter of the county in which it is found is added in parenthesis. Thus (C-141) refers to the serial number of a tabulated well in Cabell county, or the Henry Raymond well, located in McComas district, Cabell county. In a similar manner (L-300) and (W-25) refer to the serial number of wells given in the Lincoln and Wayne tables, respectively.

In the elevation column, the elevation of the top of the wells was obtained by aneroid checked on nearby U. S. G. Survey spirit level elevations, and when the letter "I" is placed after said elevations, it indicates that the elevation of the top of the well was obtained by spirit level.

The elevations of the tops of the wells are expressed in feet above tide. In the elevation column under **Berea**, the figures express feet below tide.

The accompanying table of wells drilled for oil and gas in Cabell county is quite convenient for ready reference of those wells that penetrate through the Salt Sand, Big Lime, Big Injun and Berea Sands. However, it is quite important that a complete record of a number of wells be given not only to preserve them from loss, but for the vast amount of information they contain as to the presence or absence of the coal beds and also all the oil and gas sands.

In order to determine the accurate location of any well mentioned, it is only necessary to refer to its serial number published in the table, and with the heading of the well record and also on the economic geology map accompanying this report in a separate cover.

The well records in the different magisterial districts of Cabell county will now be considered.

Summarized Record of

No. on Map.	Name of Well.	District.	Owner	Eleva- tion	No. 5 BLOCK COAL	
					Depth (top)	Thick- ness
1	T. J. Guinn.....	Grant.....	.....	576	.....	.....
2	Thos. Blake.....	Grant.....	.....	592	.....	.....
3	East End Land Co.....	Grant.....	United Fuel Co.....	1030	.....	.....
4	East End Land Co.....	Grant.....	United Fuel Co.....	978	208	.....
5	.....	.....	Walton O. & G. Co.....	729	.....	.....
6	Reese No. 1.....	Grant.....	.....	630	.....	.....
7	W. W. Conner No. 1.....	Grant.....	Harshbarger O. & G. Co.	585	.....	.....
8	J. D. Carter.....	Grant.....	Harshbarger O. & G. Co.	605	717	3
9	W. W. Conner No. 3.....	Grant.....	Harshbarger O. & G. Co.	585	.....	.....
10	Sadie Johnson No. 1.....	Grant.....	Harshbarger O. & G. Co.	605	.....	.....
11	J. W. Williams.....	Grant.....	Gt. Kanawha Gas Co.....	725	.....	.....
12	David Akers No. 1.....	Grant.....	Gt. Kanawha Gas Co.....	690	.....	.....
13	Harshbarger No. 1.....	Grant.....	Columbia G. & E. Co.....	717L	.....	.....
14	W. L. Rucker.....	Grant.....	Gt. Kanawha Gas Co.....	735	.....	.....
15	Walton No. 1.....	Grant.....	Columbia G. & E. Co.....	807	.....	.....
17	John Handley.....	Grant.....	Harshbarger O. & G. Co.	640	.....	.....
18	Taz. Chapman No. 1.....	Grant.....	Harshbarger O. & G. Co.	765	.....	.....
19	E. W. Beckett No. 6.....	Grant.....	Harshbarger O. & G. Co.	630	.....	.....
20	E. W. Beckett No. 5.....	Grant.....	Harshbarger O. & G. Co.	885	.....	.....
21	T. J. Berkley No. 5.....	Grant.....	J. M. McCoach & Co.....	890	.....	.....
22	J. & J. H. Harshbarger No. 1.....	Grant.....	Harshbarger O. & G. Co.	655	.....	.....
23	J. & J. H. Harshbarger.....	Grant.....	Harshbarger O. & G. Co.	775	735	8(?)
24	G. Kilgore Hrs. No. 2.....	Grant.....	Harshbarger O. & G. Co.	670	.....	.....
25	C. C. Beckett No. 1.....	Grant.....	Newton O. & G. Co.....	645	690	8(?)
26	W. E. Porter No. 1.....	Grant.....	Columbia G. & E. Co.....	610L	.....	.....
27	Oscar Foble.....	Grant.....	Columbia G. & E. Co.....	610	.....	.....
28	W. W. Conner No. 2.....	Grant.....	Harshbarger O. & G. Co.	585	.....	.....
29	Reese No. 2.....	Grant.....	.....	675	.....	.....
30	R. C. Kilgore No. 5.....	Grant.....	Harshbarger O. & G. Co.	755	.....	.....
31	R. C. Kilgore No. 4.....	Grant.....	Harshbarger O. & G. Co.	700	.....	.....
32	S. A. Roberts No. 2.....	Grant.....	Fought O. & G. Co.....	775	.....	.....
33	S. A. Roberts No. 3.....	Grant.....	Fought O. & G. Co.....	610	.....	.....
34	E. W. Braley No. 2.....	Grant.....	Harshbarger O. & G. Co.	840	.....	.....
35	E. W. Braley No. 4.....	Grant.....	Harshbarger O. & G. Co.	831	.....	.....
36	E. W. Braley No. 3.....	Grant.....	Harshbarger O. & G. Co.	750	.....	.....
37	J. W. Kilgore No. 3.....	Grant.....	Harshbarger O. & G. Co.	610	.....	.....
38	J. W. Kilgore No. 2.....	Grant.....	Harshbarger O. & G. Co.	695	.....	.....
39	J. H. Hughes No. 1.....	Grant.....	Harshbarger O. & G. Co.	715	.....	.....
40	E. W. Beckett No. 1.....	Grant.....	Harshbarger O. & G. Co.	615	738	3(?)
41	E. W. Beckett No. 2.....	Grant.....	Harshbarger O. & G. Co.	750	.....	.....
42	E. W. Beckett No. 3.....	Grant.....	Harshbarger O. & G. Co.	825	.....	.....
43	E. W. Beckett No. 4.....	Grant.....	Harshbarger O. & G. Co.	740	.....	.....
44	J. & J. H. Harshbarger No. 3.....	Grant.....	Harshbarger O. & G. Co.	910	.....	.....
45	A. A. Swan No. 2.....	Grant.....	.....	920	560	5
46	A. A. Swan No. 1.....	Grant.....	.....	.....	.....	.....
47	C. C. Beckett No. 2.....	Grant.....	Harshbarger O. & G. Co.	645	.....	.....
48	C. C. Beckett No. 3.....	Grant.....	Harshbarger O. & G. Co.	610	.....	.....
49	T. J. Berkley No. 2.....	Grant.....	Newton O. & G. Co.....	875	.....	.....
50	T. J. Berkley No. 1.....	Grant.....	Newton O. & G. Co.....	820	.....	.....
51	T. J. Berkley No. 6.....	Grant.....	Newton O. & G. Co.....	820	.....	.....
52	T. J. Berkley No. 4.....	Grant.....	Newton O. & G. Co.....	820	.....	.....
53	T. J. Berkley No. 7.....	Grant.....	Newton O. & G. Co.....	780	.....	.....
54	T. J. Berkley No. 8.....	Grant.....	Newton O. & G. Co.....	805	.....	.....
55	T. J. Berkley No. 9.....	Grant.....	Newton O. & G. Co.....	910	.....	.....
56	T. J. Berkley No. 10.....	Grant.....	Newton O. & G. Co.....	610	.....	.....
57	Geo. Kilgore Hrs. No. 1.....	Grant.....	Harshbarger O. & G. Co.	610	.....	.....
58	Geo. Kilgore Hrs. No. 3.....	Grant.....	Harshbarger O. & G. Co.	635	.....	.....
59	R. C. Kilgore No. 2.....	Grant.....	Harshbarger O. & G. Co.	780	.....	.....
60	R. C. Kilgore No. 1.....	Grant.....	Harshbarger O. & G. Co.	610	630	6
61	C. C. Beckett No. 1.....	Grant.....	Harshbarger O. & G. Co.	655	.....	.....
62	C. E. Burns No. 3.....	Grant.....	Charley Cr. O. & G. Co.....	665	.....	.....

SALT SAND.		BIG LIME.		BIG INJUN SAND		BEREA SAND.		Total Depth.	Producing Sand.	No. on L
Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness			
								2300		2
										3
		1698	232	1930	100	2434	17	2454		4
										5
850	200	1050	365	1415	200	2029	19	2780		6
		1520	90	1462	148	2050	40	2125	Gas, 1350'; oil, 1400'	7
										8
						2024	24	2053	Gas, 2024-40	9
				1640	110	2150	20	2173		10
940	400	1340	170	1570	150	2100	15	2115	Berea, gas.	11
940	380	1340	150	1600	70	2105	20	2125	Berea, gas, 1 mil.	12
		1400	165	1680	80	2143	20	2163		13
980	410	1430	195	1670	100	2196	19	2215	Berea, gas, 1 mil.; pay, 10'	14
968	46			1628	94	2135	29	2181	Big Injun, gas and water.	15
		1457						1604	Gas, 1571; oil, 1506.	16
940								1446	Best pay, 1426-34.	17
								1695	Pay sand, 1672-80.	18
										19
								1476	Pay sand, 1341-1447.	20
								1588	Oil, 1561-73.	21
		1296	104					1510	Pay sand, 1496-1501.	22
								1423	First pay, 1400-11.	23
815	185	1225	195	1420	130	1988	23	1377	Berea, gas, 5 mil.; show oil.	24
780	325	1215	200	1445	75	1978	15	1998	Berea, gas, ½ mil.; pay, 1978-93.	25
925	345	1315		1550	90	2050	30	2150	Big Lime, show oil and gas.	26
										27
										28
995	5							1545	Oil and gas, 1522-33.	29
								1523	Gas and oil, 1390-1494.	30
										31
										32
								1621	77 bbls. natural.	33
								1647	Oil and gas, 1620-30.	34
1170	185	1432	97					1558	Gas, 1115; best pay, 1529-43.	35
								1421	Oil, 1398-1468.	36
								1496	Pay, 1469-82.	37
										38
								1400	Show oil, 644, 732, 1263, 1393.	39
								1558	Show oil, 1445; oil pay, 1539-58.	40
		1538	89					1652	Gas, 1598.	41
		1696	106			2240	26	2266	Gas, 1070, 1624, 2242.	42
								1728	Oil and gas, 1714.	43
								1675		44
								1606	Trace of oil, 1580.	45
								1448	Gas and oil, 1426; pay, 1436.	46
								1403	Pay, 1380-1390.	47
										48
										49
										50
										51
										52
										53
										54
										55
860	30	1305						1407	Gas and 1st pay, 1388.	56
									Oil at 1410-1418.	57
1090	402			1650	135	2220	22	2250	Show oil, 1574; gas, 1713.	58
										59
										60
										61
										62

Summarized Record of Wells

No. on Map.	Name of Well.	District.	Owner	Eleva- tion	No. 5 BLOCK COAL	
					Depth (top)	Thick- ness
63	C. E. Burns No. 4.....	Grant.....	Charley Cr. O. & G. Co..	665	.....	.....
64	C. E. Burns No. 1.....	Grant.....	Charley Cr. O. & G. Co..	645	.....	.....
65	C. E. Burns No. 8.....	Grant.....	Charley Cr. O. & G. Co..	730	.....	.....
66	C. E. Burns No. 5.....	Grant.....	Charley Cr. O. & G. Co..	745	.....	.....
67	C. E. Burns No. 2.....	Grant.....	Charley Cr. O. & G. Co..	660	.....	.....
68	C. E. Burns No. 7.....	Grant.....	Charley Cr. O. & G. Co..	840	.....	.....
69	C. E. Burns No. 6.....	Grant.....	Charley Cr. O. & G. Co..	840	.....	.....
70	S. A. Roberts No. 1.....	Grant.....	Fought O. & G. Co.....	610	.....	.....
71	J. W. Kilgore No. 1.....	Grant.....	Harshbarger O. & G. Co.	670	.....	.....
72	E. W. Braley No. 8.....	Grant.....	Harshbarger O. & G. Co.	645	.....	.....
73	E. W. Braley No. 1.....	Grant.....	Harshbarger O. & G. Co.	730	.....	.....
74	E. W. Braley No. 11.....	Grant.....	Harshbarger O. & G. Co.	865	.....	.....
75	E. W. Braley No. 5.....	Grant.....	Harshbarger O. & G. Co.	900	.....	.....
76	E. W. Braley No. 6.....	Grant.....	Harshbarger O. & G. Co.	885	.....	.....
77	E. W. Braley No. 9.....	Grant.....	Harshbarger O. & G. Co.	990	.....	.....
78	E. W. Braley No. 7.....	Grant.....	Harshbarger O. & G. Co.	940	.....	.....
79	Chas. Harbour No. 2.....	Grant.....	South Penn Oil Co.....	935	.....	.....
80	Chris. Fruitel No. 2.....	Grant.....	.....	955	.....	.....
81	Chris. Fruitel No. 4.....	Grant.....	South Penn Oil Co.....	980	.....	.....
82	E. W. Braley No. 10.....	Grant.....	Harshbarger O. & G. Co.	975	.....	.....
83	Chas. Harbour No. 1.....	Grant.....	Newton O. & G. Co.....	650	.....	.....
84	Erwin & Kane No. 1.....	Grant.....	.....	645	.....	.....
85	T. A. Swan No. 1.....	Grant.....	.....	695	.....	.....
86	Smith & Beckett No. 1.....	Grant.....	.....	605	.....	.....
87	German Chapman.....	Grant.....	Harshbarger O. & G. Co.	945	.....	.....
88	C. Harbour No. 1.....	Grant.....	South Penn Oil Co.....	925	.....	.....
89	W. W. Conner No. 3.....	Grant.....	Harshbarger O. & G. Co.	585	.....	.....
90	Galleher Johnson.....	Grant.....	Harshbarger O. & G. Co.	595	.....	.....
91	John Conner No. 1.....	Grant.....	Harshbarger O. & G. Co.	600	.....	.....
92	John Conner No. 2.....	Grant.....	.....	815	.....	.....
93	John Conner No. 3.....	Grant.....	.....	865	.....	.....
94	Joseph Conner No. 1.....	Grant.....	Harshbarger O. & G. Co.	890	.....	.....
95	Adam Conner.....	Grant.....	South Penn Oil Co.....	920	.....	.....
96	C. C. Conner No. 1.....	Grant.....	.....	675	.....	.....
97	Chris. Fruitel No. 1.....	Grant.....	.....	675	.....	.....
98	Chris. Fruitel No. 5.....	Grant.....	.....	680	.....	.....
99	J. D. Carter No. 2.....	Grant.....	G. A. Fought O. & G. Co.	640	.....	.....
100	Chris. Fruitel No. 3.....	Grant.....	.....	690	.....	.....
101	Chris. Fruitel No. 6.....	Grant.....	.....	875	.....	.....
102	Mary Kindle No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	600	.....	.....
103	Mary Kindle No. 2.....	Grant.....	Gt. Kanawha O. & G. Co.	615	.....	.....
104	Harshbarger & Kane No. 2.....	Grant.....	Columbia G. & E. Co.....	705	.....	.....
105	Henry Braley.....	Grant.....	Gt. Kanawha O. & G. Co.	1000	.....	.....
106	John Akers No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	720	580	10(?)
107	J. N. Wallace No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	650	.....	.....
108	T. A. Chaney No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	650	.....	.....
109	John White No. 2.....	Grant.....	Weiler Bros.....	755	.....	.....
110	W. E. Martin No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	655	.....	.....
111	L. F. Wood No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	645	.....	.....
112	John White No. 1.....	Grant.....	Gt. Kanawha O. & G. Co.	625	.....	.....
113	I. J. Harshbarger No. 1.....	Grant.....	Milton O. G. & Min. Co.	615	.....	.....
114	Henry Gerlock.....	Grant.....	Tri-State O. & G. Co....	600	.....	.....
115	Preston Keaton.....	Grant.....	Harshbarger O. & G. Co.	620	479	5
116	F. F. McCullough.....	Grant.....	Cole & Nixon.....	790	.....	.....
117	H. L. McCoy.....	Grant.....	Cole & Nixon.....	640	.....	.....
118	Elijah Chapman.....	Grant.....	Huntington O. & G. Co..	700	.....	.....
119	J. W. Keaton.....	Grant.....	Gt. Kanawha O. & G. Co.	700	.....	.....
120	John Sandy No. 1.....	Grant.....	.....	660	.....	.....
121	J. W. Clark.....	Grant.....	Nixon et al.....	605	.....	.....
122	T. A. Love No. 1.....	Grant.....	Pew et al.....	650	.....	.....
123	Thos. Woodruff.....	Grant.....	McBride & McBride.....	690	.....	.....

SALT SAND.		BIG LIME.		BIG INJUN SAND		BEREA SAND.		Total Depth.	Producing Sand	No. on Map.
Depth (top)	Thick- ness	Depth (top)	Thick- ness	Depth (top)	Thick- ness	Depth (top)	Thick- ness			
.	63
.	64
.	65
.	66
.	67
.	68
.	2060	23	2083	.	69
.	1499	Gas, 1469; oil, 1471; pay, 1480.	70
.	1450	Gas, 1418; oil, 1424-34.	71
.	997	Show oil, 240; gas, 380, 986, 997.	72
.	.	1552	1683	Oil sand, 1660-1670.	73
.	1785	Pay, 1677-85.	74
.	Oil pay, 1671-86.	75
.	1804	Dry hole; gas show, 1180.	76
.	1800	Gas, 1227; oil & gas, 1779-91.	77
.	1712	Well abandoned.	78
1190	350	1616	208	1824	60	2379	20	2399	Gas, 1194-1214; oil, 1219; gas, 2376	79
.	1240	Gas, 1230, Aug. 12, 1910.	80
.	1753	.	81
1180	67	1617	120	1860	70	2377	24	2401	Show gas, 739; show oil, 1752.	82
.	83
.	Dry hole.	84
.	85
.	1216	.	86
.	87
.	2065	Gas, 2061.	88
.	89
.	90
.	91
1170	40	1210	.	92
1174	22	Salt sand, gas, 1 mil.	93
.	94
.	95
.	96
.	97
.	98
1190	9	1199	Gas show, 1192.	99
.	.	1256	80	1336	Big Lime, gas.	100
930	150	1355	175	1590	100	2110	23	2133	Berea, gas, $\frac{3}{4}$ mil.; oil, 1540.	101
1011	243	1428	158	1664	84	2391	26	2417	Berea, gas.	102
960	410	1702	150	1601	65	2163	20	.	Berea, gas.	103
956	2111	25	2149	Berea, gas, 2' in.	104
.	Berea and Salt, gas.	105
.	106
.	Big Lime, oil.	107
977	403	1395	169	1644	74	2159	20	2179	Berea, gas.	108
930	403	1395	155	1590	65	2100	25	2128	Gas, 1 mil.	109
.	110
.	111
.	112
.	113
.	114
.	.	1372	128	1470	110	2020	30	2065	Oil show, 870; gas, 1295.	115
830	.	.	.	1580	85	2137	18	2157	Berea, oil, 990; gas 2137-55.	116
.	830	.	117
.	.	1268	177	1545	.	2025	21	2046	Berea, gas.	118
1130	365	1495	135	1710	100	2231	20	2375	Water, 1504 and 1725.	119

Summarized Record of Wells

No. on Map.	Name of Well.	District.	Owner	Eleva- tion	No. 5 BLOCK COAL	
					Depth (top)	Thick- ness
124	T. A. Love No. 2.....	Grant.....	McBride & McBride.....	610
125	T. & J. H. Harshbarger No. 2.....	Grant.....	Harshbarger O. & G. Co.	810
126	Sam'l Handley.....	Grant.....	Harshbarger O. & G. Co.	592
127	Chas. Winters.....	Barboursville.	Home Capital.....	557L
128	J. W. Jenkins.....	Union.....	Dimick et al.....	560	504	8(?)
129	J. C. Dillon.....	McComas.....	Guffey & Galey.....	645
130	T. J. Edwards.....	Barboursville.	595
131	Thos. Hendricks.....	Barboursville.	Lowther & Fitch.....	565	641	4(?)
132	J. J. Christian.....	Barboursville.	575
133	Virginia Morrison.....	Grant.....	Nixon et al.....	680
134	J. L. Caldwell.....	McComas.....	615
135	Ruhl Porter.....	McComas.....	Lawrence Oil Co.....	605
136	Walter Swan No. 1.....	McComas.....	Lawrence Oil Co.....	605
137	Walter Swan No. 2.....	McComas.....	Lawrence Oil Co.....	625
138	Walter Swan No. 3.....	McComas.....	Home Capital.....	655
139	Walter Swan.....	McComas.....	Lawrence Oil Co.....	555
140	Walter Swan.....	McComas.....	Lowther Oil Co.....	575
141	Henry Raymond.....	McComas.....	Guffey & Galey.....	730L
142	Jas. H. Wright.....	Guyandot.....	Wayne Oil Co.....	720
143	W. B. Hutchinson.....	Guyandot.....	650
144	T. H. Harvey.....	Guyandot.....	530
145	Harshbarger No. 3.....	Grant.....	Columbia G. & E. Co....	986L
146	C. & O. Shops.....	Guyandot.....	660	478	4(?)
147	McKeand No. 1.....	Barboursville.	Wayne O. Co.....
148	C. Crane & Co No. 1.....	Guyandot.....	C. Crane & Co.....	550	490	10
149	Altizer.....	Guyandot.....	545

in Cabell County.—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND		BEREA SAND.		Total Depth	Producing Sand	No. on Map.
Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness			
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	124
.....	.....	1501	95	.....	.....	.....	.....	1632	.....	125
.....	.....	.....	.....	.....	.....	2217	.....	.....	.....	126
.....	.....	1344	140	.....	.....	.....	.....	2550	.....	127
1004	190	1344	140	.....	.....	.....	.....	2550	.....	128
800	400	1220	170	1410	30	.....	.....	1998	Oil, 1390; no Berea sand.....	129
1071	129	1262	190	1459	121	2020	12	2080	Dry; water, 63, 520 and 1462.....	130
1200	230	1565	135	1780	110	2312	14	2338	.....	131
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	132
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	133
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	134
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	135
950	420	1385	200	1625	90	.....	.....	1755	Dry hole.....	136
920	410	1330	165	1555	100	.....	.....	1675	Dry hole.....	137
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	138
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	139
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	140
750	.....	1220	246	1520	33	.....	.....	1555	Oil show, 1350 & 1375, gas, 1340...	141
950	180	1300	148	1532	170	.....	.....	1702	Dry hole.....	142
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	143
.....	.....	970	150	1148	177	1730	25	2770	Dry hole; show of gas.....	144
.....	.....	1650	190	1880	91	2400	20	2420	Berea, gas, $\frac{3}{4}$ mil; gas pay 20'....	145
900	100	.....	.....	.....	.....	.....	.....	1977	.....	146
535	130	1421	179	1639	26	2285	5	2300	Dry.....	147
900	25	1120	120	.....	.....	1900	6	1958	Little gas in Berea.....	148
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	149

Union District Well Records.

Union district lies in the northern part of Cabell county, bordering Mason on the east and bounded by the Ohio river on the north and west. The district lies north of the Parkersburg syncline. The rocks in this district are nearly horizontal, except a gentle rise towards the west, out of this Parkersburg syncline. This very simple geologic structure is quite unfavorable for the accumulation of either oil or gas in rich pools and thus the sands penetrated by the drill have not yielded oil and gas of commercial value, but often much water, the relief evidently being too slight to permit the separation of these three substances into pools of commercial value.

At the northern part of the district, near Crown City Ferry, Messrs. Dimmick et al, of Huntington, W. Va., drilled an unproductive well on the property of J. W. Jenkins, the record of which is as follows:

J. W. Jenkins Well (C-128), Union District.

Located $\frac{1}{2}$ mile northeast of Crown City Ferry; authority, G. H. Dimmick; elevation, 560' A. T. B.

	Thickness. Feet.	Total. Feet.
Conductor	50	50
Blue slate	20	70
Sandstone, (Buffalo)	50	120
Slate	354	474
Sand, hard	30	504
Coal	8	512
Sand	35	547
Slate and shale.....	457	1004
Sand, (Salt)	190	1194
Slate	20	1214
Sand	130	1344
Lime, (Big Lime).....	140	1484
Sand, (Big Injun).....	90	1574
Slate and shells.....	200	1774
Dark sand, Berea	25	1799
Red rock	50	1849
Shale and slate.....	701	2550

The coal reported at 504 feet is one of the Allegheny series and may be either the Lower Freeport or the Middle Kittanning bed. The writer is rather skeptical in regard to the thickness of this bed. The coal is possibly divided with slate as shown in the core drill holes put down at Gallipolis Ferry on the Poplar Grove Farm and published in Volume II(A) of the West Virginia Geological Survey, page 620. Here the section of this coal was as follows:

	Ft.	In.
Coal	3	0
Slate	7	0
Coal	2	0

The dark sand at 430 feet below the top of Big Lime is possibly the Berea Grit.

Grant District Well Records.

Grant district adjoins Union on the north and Barboursville on the west. The **Milton oil field** occurs in the southern part of the district where oil is produced from the Beckett sand. The Milton oil field covers about 200 acres, but has been very rich in the production of oil. The pool was opened

in October, 1903, by the E. W. Beckett well No. 1, located two miles and a half southeast from Milton, and drilled by the Walton Oil & Gas Company. The following is the record of this well:

E. W. Beckett Well No. 1 (C-40).

Located $2\frac{1}{2}$ miles southeast from Milton. Authority, C. F. Cole. Elevation, 615' A. T. B.

	Thickness Feet.	Total Feet.	
Sand, clay and gravel to.....	50	50	
Red rock.....	30	80	
Slate and fire clay.....	80	160	
Coal, show.....		160	
Slate	20	180	
White sand, show of oil and water.....	12	192	
Slate	68	260	
Sand, making two bailers of oil per hour (Dunkard)	8	268	
Slate	42	310	
Sand with water.....	20	330	
Slate	45	375	
Sand with snow of green oil and water to bottom, East Lynn.....	45	420	
Slate	55	475	
Coal, Stockton?.....	7	482	
Sand with gas, water in bottom.....	18	500	
Slate	144	644	
Sand, showing black oil.....	30	674	
Lime	16	690	Allegheny and Pottsville Series, 933'
Slate	39	729	
Coal, No. 2 Gas?.....	3	732	
Sand, showing black oil and gas.....	17	749	
Slate	51	800	
Sand	37	837	
Slate	8	845	
Sand	7	852	
Slate	54	906	
Sand	54	960	
Lime	70	1030	
Sand, showing black oil, water 25' in sand..	127	1157	
Sand with water.....	106	1263	
Big Lime	115	1378	
Sand, Beckett, white, with oil and gas; hole filled 1200 feet in 2 hours; oil sand..	15	1393	
Lime and sand.....	7	1400	
Lime, slate, and shale to bottom.....	41	1441	

Production, 247 bbls. first 24 hours.

The sands with oil at 180 to 420 feet in this well represent the "shallow" sands of the northern portion of the State, and the great sandstone bluffs at Charleston, Kanawha

county. The oil at 260 feet is of 46° gravity and a beautiful reddish amber in color.

The Va-Ken-O Oil and Gas Company drilled the J. A. Reese well No. 1, one mile and a quarter southeast of Milton and about the same distance northwest of the E. W. Beckett Well No. 1. The following is a record of same:

J. A. Reese Well No. 1 (C-6), Grant District.

Elevation, 630 ' A. T. B. Authority, C. F. Cole.

	Thickness Feet.	Total Feet.
Soil	4	4
Sand, hard	96	100
Slate	15	115
Red rock (10" casing, 143')	28	143
Blue slate	14	157
Lime shells	12	169
Red rock	10	179
Lime shells	10	189
Lime, hard	10	199
Slate	7	206
Lime shell	4	210
Lime shell, broken	10	220
Lime, hard	10	230
Slate, blue	12	242
Lime	5	247
Sand	12	259
Sand	12	271
Slate, red	6	277
Shale, white	6	283
Sand, white and hard	15	298
Red shale	7	305
Lime shells	10	315
White sandy shale	29	344
White slate	30	374
Blue slate	10	384
Lime	14	398
Sandstone, broken	12	410
Slate	40	450
White sandstone, top pebbly, traces of water at bottom	45	495
Sand, gray	8	503
Slate	39	542
White sand	40' } Homewood	626
Slate, white and black	44' }	
Coal, Stockton	6	632
White sand, water enough to drill with	26	658
Black slate	40	698
Sand, gray	65	763
Sand, white, water 10 bailers per hour	48	811
Black slate	76	887
Sand, white	40	927
Black slate	12	939

	Thickness Feet.	Total. Feet.
Sand, white	35	974
Lime	6	980
Sand, white	10	990
Black slate	15	1005
Sandy shale	10	1015
Lime shells	7	1022
Black slate	40	1062
White sand, full of water..92'	} Salt sand... 331	1393
Black slate 3		
White sand .....60		
Black slate .....95		
Limy shells .....83		
Black slate 5		
Lime, flinty .....20		
White sand.....63		
Sand, black, hard and limy.....	100	1493
Big Lime	63	1556
White sandy grit, Beckett sand	40	1596
White slate	15	1611
Black slate	10	1621
Gray pebbly sand.....	36	1657
Black slate	24	1681
Big Injun sand (show of oil, 1696', hole filled with water, 1707').....	95	1776
Black slate	8	1784
White sand, probably " Squaw ".....	5	1789
Black slate	109	1898
White sand	9	1907
Black slate	293	2200
Berea sand , flow of gas on top.....	23	2223
Bottom of hole	3	2226

Volume of 800,000 cubic feet of gas per day from the Berea sand with a rock pressure of 600 pounds per square inch.

The coal encountered at 626 feet is possibly the Stockton and the white sand and slate overlying same, the Homewood.

The top of the Berea sand occurs 707 feet below the top of the Big Lime, and has gas near the top of same.

The John Handley well No. 1 was drilled by the Harshbarger Oil & Gas Company, located on Charley creek, 4 miles and a half southeast from Milton and about one-half mile west of the Putnam-Cabell line. Its record is as follows:

John Handley Well No. 1 (C-17), Grant District.

Elevation, 640' A. T. B. Authority, Harshbarger Oil & Gas Co.

	Thickness Feet.	Total Feet.
Clay and gravel.....	62	62
Slate and shells.....	278	340
Sand	38	378
Slate and sand	96	474
Sand, water	11	485
Sand	69	554
Slate	16	570
Sand	30	600
Slate and shells.....	368	968
Sand	46' }	Salt sand.. 192
Slate	103 }	
Sand	43 }	
Coal	4	1164
Slate	160	1324
Sand	21	1345
Unrecorded	61	1406
Big Lime.....	140	1546
Slate	8	1554
Lime	16	1570
Sand, Keener	40	1610
Slate	18	1628
Big Injun, water and gas.....	94	1722
Slate and shale.....	413	2135
Berea sand	29	2164
Slate to bottom.....	17	2181

Gas in Berea, 5 feet from top. The top of the Berea sand is 729 feet below the top of the Big Lime and is 29 feet thick. The Beckett sand appears to be absent.

The E. W. Brady well No. 2 is located in the center of the pool between Charley creek and Two Mile creek, and was drilled by the Harshbarger Oil & Gas Company of Milton, W. Va., the following record being furnished by said Company:

E. W. Brady Well No. 2 (C-34), Grant District.

Located between Charley and Two Mile creeks; elevation, 750' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	410	410
White sand	20	430
White slate	25	455
Sand	45	500
Slate	95	595
Sand	85	680

	Thickness Feet.	Total. Feet.
Slate, black	20	700
Sand, white	80	780
Slate, white	150	930
Sand, white	35	965
Slate, black.....	60	1025
Sand, white	35	1060
Slate, black	55	1115
Salt sand	315	1430
Slate, black	5	1435
Sand, white	45	1480
Lime, black (Little Lime).....	17	1497
Slate, black, (Pencil cave?).....	3	1500
Lime, black.....10' } Big Lime ..	100	1600
Lime, white.....90 }		
Sand, Beckett	12	1612
Total depth		1621

First day's production, 77 barrels, natural flow.

The Great Kanawha Gas Company drilled three wells along the eastern edge of the oil pool on Charleys creek. The following is a record of the L. F. Wood well No. 1 (C-III), located on Charleys creek, about one mile above the mouth of Hudson Hollow and $1\frac{1}{2}$ miles southwest of Culloden:

L. F. Wood Well No. 1 (C-III), Grant District.

Elevation, 645' A. T. B. Authority, John Frazier, Supt., The Great Kanawha Gas Company.

	Thickness Feet.	Total Feet.
Unrecorded	977	977
Salt sand	403	1380
Black sand	15	1395
Big Lime	169	1564
Unrecorded	80	1644
Big Injun sand	74	1718
Unrecorded	441	2159
Berea sand, gas	20	2179

Near the southern end of the Milton pool, the Columbia Gas & Electric Company drilled the Walton well No. 1, located on the headwaters of Little Two Mile creek of Mud river, southeast 5 miles from Milton. The following record of this well was obtained:

Walton Well No. 1 (C-15), Grant District.

Elevation, 807' A. T. B. Authority, Columbia Gas & Electric Company.

	Thickness Feet.	Total Feet.
Unrecorded	835	835
Sand	45	880
Unrecorded	100	980
Salt sand	410	1390
Unrecorded	40	1430
Big Lime	195	1625
Unrecorded	45	1670
Big Injun sand.....	100	1770
Unrecorded	426	2196
Berea sand, gas 1 million feet at 2196'-2206'	19	2215

The following is the record of Harshbarger well No. 1, located on Little Two Mile creek of Mud river, S 23° E, 3¼ miles from Milton, and drilled by the Columbia Gas & Electric Company.

Harshbarger Well No. 1 (C-13), Grant District.

Elevation, 717' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	60	60
Sand, fresh water.....	30	90
Unrecorded	850	940
Salt sand	380	1320
Little Lime	20	1340
Big Lime	150	1490
Unrecorded	110	1600
Big Injun sand.....	70	1670
Unrecorded	435	2105
Berea sand, gas, 1,000,000 feet.....	20	2125

The William Porter well No. 1, located near Ball Gap, south, 5 miles from Milton, was drilled by the Columbia Gas & Electric Company, and the following is the record of said well, copied from the Company's books:

William Porter Well No. 1 (C-26), Grant District.

Elevation, 611' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	640	640
Gas sand	50	690

	Thickness Feet.	Total. Feet.
Unrecorded	125	815
Salt sand	285	1100
Coal	4	1104
Unrecorded	96	1200
Little Lime	20	1220
Pencil cave	5	1225
Big Lime	195	1420
Big Injun sand.....	130	1550
Unrecorded	438	1988
Berea sand, gas 5 million feet.....	23	2011

The Big Lime has attained a thickness of 195 feet, and the Beckett sand appears to be absent from the section. The Berea sand occurs 763 feet below the top of the Big Lime.

The following is the record of the J. W. Akers well No. 1, located on Charleys creek, about 7 miles southeast of Milton, and drilled by the Great Kanawha Oil & Gas Company:

J. W. Akers Well No. 1 (C-106), Grant District.

Elevation, 720' A. T. B. Authority, John Frazier.

	Thickness Feet.	Total Feet.
Sand	30	30
Slate	160	190
Sand	40	230
Slate	50	280
Slate	210	490
Sand	90	580
Coal, No. 5 Block?.....	10?	590
Slate	20	610
Sand	40	650
Slate	165	815
Sand	24	839
Slate	172	1011
Salt sand	243	1254
Slate	28	1282
Sand	24	1306
Slate	26	1332
Sand	58	1390
Little Lime	29	1419
Pencil cave	9	1428
Big Lime	160	1588
Unrecorded	76	1664
Big Injun sand.....	80	1748
Unrecorded	415	2163
Berea sand, gas.....	20	2183

The coal encountered at 580 feet is possibly the No. 5 Block of the Kanawha series. The top of the Berea sand occurs 749 feet below the top of the Big Lime.

The following is the record of the F. F. McCullough well No. 1, located on Mile branch of Mud river, 3 miles south of Milton, and drilled by Messrs. Cole and Nixon, of Milton, W. Va.:

F. F. McCullough Well No. 1, Grant District.

Elevation, 798' A. T. L.. Authority, C. O. Nixon.

	Thickness Feet.	Total Feet.
Conductor	20	20
Slate	20	40
Sand	15	55
Slate	100	155
Sand	40	195
Slate	45	240
Sandstone, gray.....	17	257
Red rock	13	270
Lime and shells	5	275
Slate	15	290
Red rock	10	300
Slate	40	340
Sandstone, white	35	375
Slate	35	410
Sand	5	415
Slate	25	440
Sand	96	536
Slate	10	546
Sand	54	600
Slate	5	605
Sand, hard	135	740
Slate	15	755
Sand	45	800
Slate	25	825
Sand	30	855
Slate	5	860
Sand	20	880
Slate	100	980
Sand (show of oil).....	10	990
Sand, slaty.....	30	1020
Sand, water	180	1200
Slate	10	1210
Lime, black.....	15	1225
Red rock, slate and limestone.....	75	1300
Lime, blue	5	1305
Red rock	10	1315
Sand	25	1340
Slate, blue	10	1350
Lime, black	5	1355

	Thickness Feet.	Total. Feet.
Lime, white	15	1370
Slate, black	2	1372
Lime, white, Big Lime	128	1500
Slate	50	1550
Sand, Keener	15	1565
Slate	15	1580
Sand, coarse, Big Injun	85	1665
Slate and shells.....	320	1985
Lime, white	40	2025
Slate and shells	77	2102
Slate, black	30	2132
Slate, coffee color.....	5	2137
Berea sand, gas, 1,000,000 cu. ft.	18	2153
Slate to bottom.....	2	2157

Barboursville District.

Barboursville district lies west of Grant and Union districts, and thus far no oil or gas of commercial value has been discovered therein.

About $\frac{3}{4}$ mile southeast from Cox Landing, the Louther Oil Company of New Martinsville, W. Va., drilled a well on the Thomas Hendricks farm, and the following is the record of same:

Thomas Hendricks Well (C-131), Barboursville District.

Located in Barboursville district on Seven Mile creek. Authority, C. O. Nixon. Elevation, 565' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	30	30
Gravel	4	34
Unrecorded, water at 63'.....	169	203
Sand	21	224
Unrecorded	160	384
Sand	108	492
Unrecorded	23	515
Sand, hole full of water at 520'.....	133	648
Coal, Middle Kittanning (No. 5 Block)	4	652
Sand, (Homewood).....	98	750
Unrecorded	35	785
Sand	21	806
Unrecorded ..	14	820
Sand	10	830
Unrecorded	72	902
Coal, Sharon?	4	906

	Thickness Feet.	Total Feet.
Sand	Salt sand.. 294	1200
Unrecorded		
Sand		
Unrecorded		
Salt sand.....	Mauch Chunk..... 62	1262
Red rock .....15'		
Unrecorded .....17		
Maxton sand.....14		
Little Lime .....11	}	
Pencil cave..... 5		
Big Lime	190	1452
Keener sand	7	1459
Big Injun sand, water at 1462'.....	121	1580
Unrecorded	440	2020
Berea sand	12	2032
Bottom of hole, well "dry".....	..	2080

The top of the well begins at 135 feet below the Pittsburgh coal. The coal encountered at 902 feet is possibly the Sharon coal of the Ohio column.

Near the southern part of the district, on Davis creek, the McKeand well No. 1 was drilled by the Wayne Oil Company of Huntington, and the following is a partial record of same:

McKeand Well No. 1 (C-147), Barboursville District.

Located on Davis creek, 4½ miles southwest of Barboursville; elevation, 707' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	535	535
Salt sand	130	665
Unrecorded	725	1390
Little Lime	10	1400
Pencil cave	21	1421
Big Lime	179	1600
Unrecorded	39	1639
Big Injun sand, show of gas and oil.....	26	1665
Unrecorded	620	2285
Sand	5	2290
Slate to bottom.....	10	2300
"Dry."		

The sand encountered at 2,290 feet is evidently a sand belonging in the Venango Oil sand Group and not the Berea sand, since the interval from the top of the Big Lime to the top of this sand is 864 feet. This distance is 104 feet greater than in the Harvey well (C-144), located at Central City, 7½

miles northwest of this well, and 108 feet greater than in the Hendricks well (C-131), located on Seven Mile creek, 8½ miles north. In the Griffithsville field, the usual interval between the tops of these two strata is 700 feet.

Guyandot District.

Guyandot district lies west of Barboursville and borders the Ohio river on the north. Several wells have been drilled in this district, but no oil or gas of commercial value has yet been found.

A deep well was drilled several years ago by Judge T. H. Harvey and others near Central City, the record of which is published in Volume I (A), West Virginia Geological Survey, pages 495-496. This record is also included in the Central City Section, page 38; of this volume.

The Wayne Oil Company drilled the J. H. Wright well No. 1 on Fourpole creek, 5 miles south of Guyandot, and the following is a partial record of same:

J. H. Wright Well No. 1, Guyandot District.

Located on Fourpole creek; elevation, 720' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	545	545
Coal, No. 5 Block?.....	5	550
Unrecorded	400	950
Salt sand	180	1130
Unrecorded	170	1300
Big Lime	180	1480
Unrecorded	52	1532
Big Injun sand, dry.....	170	1702

A well was drilled by Crane & Company on the Guyandot river about one-fourth mile east of the mouth of Gunpowder branch, and the following is a record of the same:

C. Crane & Co. Well No. 1 (C-148), Guyandot District.

Located on Guyandot river, one mile and a quarter south of Guyandot; elevation, 550' A. T. B.; authority, J. A. Boggs.

	Thickness Feet.	Total Feet.
Unrecorded	160	160
Sand	15	175
Slate	85	260
Unrecorded	3	263
Sand	127	390
Slate and shells.....	100	490
Coal, No. 5 Block?.....	10	500
Slate	125	625
Sand	50	675
Lime	50	725
Slate	50	775
Black lime.....	35	810
Slate and shells.....	90	900
Salt sand.....	25	925
Sand	75	1000
Slate and lime.....	100	1100
Gray lime.....	140	1240
White lime.....		
} Big Lime		
Sand and lime, (Beckett?).....	40	1280
Slate and shells.....	70	1350
Black slate.....	125	1475
Shells	35	1510
Slate	190	1700
Lime and shells.....	50	1750
Black slate.....	45	1795
Lime shells	8	1803
Black slate	91	1894
Lime shells.....	6	1900
Berea sand, gas, light.....	6	1906
Black slate to bottom.....	52	1958

The Chesapeake & Ohio Railroad Company drilled a deep well on the grounds south of their shops at Huntington, and the following is a record of same:

Chesapeake & Ohio Well No. 1, Guyandot District.

Elevation, 640' A. T. B.

	Thickness Feet.	Total Feet.
Clay	20	20
Red shale	330	350
Sand	125	475
Black shale.....	3	478
Coal	10	488
Shale	30	518
Coal	4	522
Shale	40	562

	Thickness Feet.	Total. Feet.
Coal	6	568
Shale	332	900
White sand.....	100	1000
Shale	172	1172
Lime, (Big Lime).....	110	1282
Slate and shale.....	461	1743
Lime	23	1766
Sand, Berea.....	15	1781
Slate	192	1973
Hard lime to bottom.....	4	1977

This record is entirely unreliable so far as the thickness of the coal beds reported is concerned, since it is almost certain that no beds of the thickness given can be found under Huntington.

McComas District.

McComas district lies south of Barboursville and Grant, and is separated from them by the Guyandot river. Several wells have been drilled in this district, but no oil or gas of commercial value has yet been found. Near the southern part of the county, on Raccoon creek, 2 miles southeast of Johnson, the Henry Raymond well No. 1 was drilled by Messrs. Guffey and Galey, of Pittsburgh, Pa., and the following is a partial record of same:

Henry Raymond Well No. 1 (C-141), McComas District.

Located on Raccoon creek; authority, Mr. Guffey; elevation, 731' A. T.

	Feet.
Salt sand at.....	750
Water at.....	850
Big Lime at.....	1240
Oil at.....	1350
Gas at.....	1340
Show of oil at.....	1375
Big Injun sand.....	1520 to 1553
Total depth.....	1555

Another well was put down by Messrs. Guffey and Galey on Raccoon creek, $2\frac{3}{4}$ miles south of Winslow and $2\frac{1}{2}$ miles northwest of the Raymond well (C-141), on the property of J. C. Dillon, and the following is a partial record of same:

J. C. Dillon Well No. 1 (C-129), McComas District.

Located on Raccoon creek; authority, Mr. Guffey; elevation, 645' A. T. B.

	Top Feet.	Bottom. Feet.	
Unrecorded	800	800	
Salt sand at.....	800	...	
Big Lime at.....	1220	1390	Show of oil.
Big Injun sand.....	1410	to 1440	
Slate and lime shells to bottom.....	1440	to 1998	Dry hole. No Berea sand.

Several wells were drilled by the Lawrence Oil Company at Salt Rock and on Toms creek, two miles north of Salt Rock.

The following is a partial record of the Walter Swan well No. 1, located on branch of Toms creek, about two miles north of Salt Rock:

Walter Swan Well No. 1 (C-136), McComas District.

Elevation, 605' A. T. B.; authority, W. H. Kember.

	Thickness Feet.	Total Feet.
Slate, shells and sand.....	560	560
Sand	15	575
Coal, Stockton?.....	6	581
Sand	30	611
Slate	339	950
Sand, Salt sand.....	420	1370
Slate	15	1385
Big Lime	200	1585
Slate	40	1625
Sand, Big Injun.....	90	1715
Slate to bottom, dry.....	40	1755

LINCOLN COUNTY WELL RECORDS.

The accompanying table of 625 wells contains the abbreviated logs of 570 borings as well as the tidal elevation of the top of the hole of 55 other wells, of which the writer was unable to obtain the records. The wells are numbered from 1 to 625 and are grouped by magisterial districts, the serial number in each instance corresponding to the number of the same well on the economic geology map accompanying this report in a separate cover. (See explanation preceding the table of Cabell county wells on page 289).

In the elevation column the elevation of the top of the hole was obtained with an aneroid barometer checked on nearby U. S. G. Survey spirit level elevations; the letter "I" by spirit level measurements. The elevation of the top of the hole is expressed in feet above tide. In the elevation column under "Berea" the figures express feet below tide; depths and thicknesses are also expressed in feet. As is the case in Cabell, the accompanying table of wells drilled for oil and gas in Lincoln county is very convenient for ready reference for those wells that penetrate to the different sands. However, it is very important that a complete record of a number of these wells be published, not only to preserve them from loss, but for the great fund of information they contain about other oil bearing horizons and the presence or absence of coal beds. The accurate location of any well is readily determined by its serial number published in the table and with the heading of the complete well record, and also on the economic geology map accompanying this report:

Summarized Record of

No. on Map.	Name of Well	District.	Owner.	Eleva- tion	No 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
1	Garrett	Duval	Holly O. & Dev. Co.	695			300	5
2	J. T. Young	Duval	Holly O. & Dev. Co.	875				
3	G. W. Burnside No. 3	Duval	Holly O. & Dev. Co.	835				
4	G. W. Burnside No. 1	Duval	Holly O. & Dev. Co.	770				
5	G. W. Burnside No. 2	Duval	Holly O. & Dev. Co.	835				
6	Casdorph	Duval		800				
7	E. White	Duval	Holly O. & Dev. Co.	735			275	5
8	A. S. Hilbert	Duval	Holly O. & Dev. Co.	780				
9	J. A. Johnson	Duval	Holly O. & Dev. Co.					
10	Thos. Barrett No. 68	Duval	Columbia G. & E. Co.	8631c				
11	H. W. Miller	Duval	Big Cr. Devel. Co.	685				
12	J. A. Griffith	Duval	Big Cr. Devel. Co.	1100				
13	Sarepta Workman	Duval	Big Cr. Devel. Co.	665			185	5
14	Octave Hager No. 1	Duval	Big Cr. Devel. Co.	670				
15	A. G. Grass No. 1	Duval	Big Cr. Devel. Co.	680				
16	Emma Griffith No. 1	Duval	Big Cr. Devel. Co.	675				
17	Nathaniel Mason No. 1	Duval	Big Cr. Devel. Co.	790			268	3
18	Emma Griffith No. 4	Duval	Big Cr. Devel. Co.	820			300	3
19	Nathaniel Mason No. 2	Duval	Big Cr. Devel. Co.	825			320	2
20	Nathaniel Mason No. 3	Duval	Big Cr. Devel. Co.	890			375	5
21	Nathaniel Mason No. 4	Duval	Big Cr. Devel. Co.	930			400	3
22	Emma Griffith No. 6	Duval	Big Cr. Devel. Co.	930				
23	Nathaniel Mason No. 2	Duval	Big Cr. Devel. Co.	980				
24	Emma Griffith No. 5	Duval	Big Cr. Devel. Co.	700			230	3
25	Emma Griffith No. 2	Duval	Big Cr. Devel. Co.	705				
26	Emma Griffith No. 3	Duval	Big Cr. Devel. Co.	710				
27	J. M. Grass No. 1	Duval	Big Cr. Devel. Co.	710				
28	J. M. Grass No. 3	Duval	Big Cr. Devel. Co.	775				
29	J. M. Grass No. 2	Duval	Big Cr. Devel. Co.	935				
30	J. M. Grass No. 4	Duval	Big Cr. Devel. Co.	970	400	3		
31	Austin Griffith No. 1	Duval	South Penn O. Co.	680				
32	Austin Griffith No. 3	Duval	South Penn O. Co.	830				
33	Austin Griffith No. 26	Duval	South Penn O. Co.	835				
34	Austin Griffith No. 24	Duval	South Penn O. Co.	745				
35	Austin Griffith No. 5	Duval	South Penn O. Co.	855				
36	Austin Griffith No. 2	Duval	South Penn O. Co.	950				
37	Austin Griffith No. 4	Duval	South Penn O. Co.	940				
38	Austin Griffith No. 27	Duval	South Penn O. Co.	1125				
39	Austin Griffith No. 7	Duval	South Penn O. Co.	1120				
40	Austin Griffith No. 16	Duval	South Penn O. Co.	840				
41	Austin Griffith No. 11	Duval	South Penn O. Co.	860				
42	Austin Griffith No. 17	Duval	South Penn O. Co.	795				
43	Austin Griffith No. 15	Duval	South Penn O. Co.	710				
44	Austin Griffith No. 25	Duval	South Penn O. Co.	800				
45	Austin Griffith No. 8	Duval	South Penn O. Co.	845				
46	Austin Griffith No. 12	Duval	South Penn O. Co.	780				
47	Austin Griffith No. 18	Duval	South Penn O. Co.	800				
48	Austin Griffith No. 21	Duval	South Penn O. Co.	855				
49	Austin Griffith No. 22	Duval	South Penn O. Co.	805				
50	Austin Griffith No. 23	Duval	South Penn O. Co.	715				
51	Austin Griffith No. 9	Duval	South Penn O. Co.	890				
52	Austin Griffith No. 10	Duval	South Penn O. Co.	915				
53	Austin Griffith No. 14	Duval	South Penn O. Co.	900				
54	Austin Griffith No. 19	Duval	South Penn O. Co.	890				
55	Austin Griffith No. 20	Duval	South Penn O. Co.	800				
56	Austin Griffith No. 13	Duval	South Penn O. Co.	965				
57	Austin Griffith No. 6	Duval	South Penn O. Co.	1015				
58	M. A. Bays No. 1	Duval	Big Cr. Dev. Co.	910				
59	M. A. Bays No. 2	Duval	Big Cr. Dev. Co.	890			276	2
60	M. A. Bays No. 3	Duval	Big Cr. Dev. Co.	890				
61	M. A. Bays No. 4	Duval	Big Cr. Dev. Co.	1025				
62	M. A. Bays No. 5	Duval	Big Cr. Dev. Co.	980	400	2		
63	M. A. Bays No. 6	Duval	Big Cr. Dev. Co.	870	310	2		

Wells in Lincoln County.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
...	...	1418	212	1630	58	2122	25	2150	Berea; gas, not worth saving.	1
963	...	...	...	...	...	...	...	971	Gas, 450 and 520.	2
...	...	...	...	...	...	...	...	963	Gas, 918,942,963; 1,360,000'	3
...	...	1406	226	1642	25	2113	24	2145	Pay, 880,900,921	4
...	...	...	...	...	...	...	...	1017	Gas, 988.	5
...	...	...	...	...	...	...	...	956	1st gas, 915'; 2nd, 935.	6
900	555	1455	235	1690	42	2183	20	2203	Berea, gas.	7
668	5	1488	180	1668	72	2143	19	2165	Berea hard.	8
...	...	...	...	...	...	...	...	...	...	9
935	595	1608	180	1795	25	2274	26	2302	Berea, gas, 2 mil.; pay, 26'	10
...	...	1475	180	1655	70	2252	22	2274	Gas	11
276	576	1886	185	2071	40	2582	23	2584	Berea, gas.	12
...	...	1635	230	1691	50	2081	25	2056	Berea, oil.	13
880	550	1430	215	1655	50	2148	21	2171	Berea, oil.	14
840	600	1440	215	1655	55	2161	20	2181	Berea, oil.	15
860	590	1450	220	1680	60	2176	19	2200	Berea, oil.	16
...	...	1600	174	1774	76	2284	22	2316	Berea, oil.	17
975	690	1665	177	1842	86	2331	22	2367	Berea, oil; gas, 1834-40.	18
066	534	1645	155	1800	60	2323	22	2351	Berea, oil.	19
040	615	1715	180	1895	60	2397	22	2419	Berea, oil.	20
060	632	1740	200	1940	45	2430	21	2451	Berea, oil.	21
050	630	1725	180	1905	50	2411	21	2432	Berea, oil.	22
...	...	...	...	...	...	...	...	...	...	23
825	630	1490	185	1675	50	2185	20	4002	Berea, oil; hole full water, 900.	24
836	645	1515	185	1700	90	2216	20	2228	Berea, oil.	25
830	645	1510	178	1688	75	2211	21	2223	Berea, oil.	26
840	672	1512	196	1708	72	2204	26	2228	Berea, oil.	27
915	640	1588	162	1750	90	2265	24	2295	Berea, oil; hole full water, 1015.	28
...	...	1765	180	1945	60	2440	21	2469	Berea, oil.	29
110	660	1810	180	1990	80	2482	21	2505	Berea, oil.	30
...	...	...	...	...	...	...	...	...	Oil	31
040	608	1648	182	1830	45	2327	21	2398	Berea, oil.	32
925	610	1650	195	1845	55	2323	22	2345	Berea, oil.	33
907	576	1572	201	1773	79	2269	22	2291	Berea, oil.	34
965	565	1640	190	1845	55	2325	22	2347	Berea, oil.	35
100	630	1770	181	1951	259	2452	22	2474	Berea, oil.	36
080	550	1752	188	1960	55	2446	22	2468	Berea, oil.	37
200	605	1910	195	2110	80	2591	22	2613	Berea, oil.	38
170	615	1890	190	2080	90	2566	23	2589	Berea, oil.	39
960	608	1685	117	1802	30	2345	22	2367	Berea, oil.	40
940	615	1645	192	1845	55	2344	23	2367	Berea, oil.	41
850	270	1576	179	1755	20	2260	21	2281	Berea, oil.	42
825	599	1522	191	1733	42	2212	20	2232	Berea, oil.	43
885	597	1595	198	1793	72	2288	21	2309	Berea, oil.	44
950	565	1634	192	1836	60	2325	20	2345	Berea, oil.	45
960	618	1650	191	1871	64	2364	21	2385	Berea, oil.	46
885	620	1600	185	1800	60	2275	22	2297	Berea, oil.	47
080	615	1635	180	1830	55	2324	22	2346	Berea, oil.	48
820	600	1505	190	1715	55	2201	21	2222	Berea, oil.	49
810	600	1505	195	1700	75	2193	21	2214	Berea, oil.	50
010	590	1710	180	1890	95	2393	22	2415	Berea, oil.	51
075	628	1788	202	2000	70	2435	23	2458	Berea, oil.	52
005	625	1714	171	1901	69	2385	22	2407	Berea, oil.	53
950	645	1695	7	1702	164	2371	23	2394	Berea, oil.	54
370	627	1590	188	1778	74	2273	20	2293	Berea, oil.	55
354	628	1758	186	1960	65	2446	21	2467	Berea, oil.	56
054	666	1778	217	2110	45	2494	22	2516	Berea, oil.	57
330	635	1715	190	1935	25	2404	23	2427	Berea, oil; gas, 1065; water, 1130.	58
044	591	1685	185	1870	60	2381	21	2405	Berea, oil; gas, 1850; water, 1080.	59
005	660	1705	185	1890	80	2383	23	2406	Berea, oil.	60
200	645	1895	171	2066	80	2560	22	2588	Berea, oil; water, 1295 and 1315.	61
090	660	1790	185	1975	75	2478	21	2499	Berea, oil; water, 1185.	62
115	625	1680	170	1850	80	2354	22½	2376½	Berea, oil; water, 1035; gas, 1810.	63

Summarized Record of Wells in

No. on Map.	Name of Well	District.	Owner	Eleva- tion	No 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
64	E. J. May No. 5	Duval	Ohio Fuel O. Co.	890	...	...	...	...
65	E. J. May No. 9	Duval	Ohio Fuel O. Co.	945	...	...	...	...
66	E. J. May No. 7	Duval	Ohio Fuel O. Co.	875	...	...	...	...
67	W. S. May No. 6	Duval	Ohio Fuel O. Co.	995	438	2	...	...
68	W. S. May No. 3	Duval	Ohio Fuel O. Co.	1020	...	...	...	...
69	W. S. May No. 8	Duval	Ohio Fuel O. Co.	1000	420	5	...	...
70	W. S. May No. 5	Duval	Ohio Fuel O. Co.	930	...	...	...	...
71	W. S. May No. 7	Duval	Ohio Fuel O. Co.	835	...	...	...	...
72	W. S. May No. 1	Duval	Ohio Fuel O. Co.	755	...	...	...	...
73	W. S. May No. 2	Duval	Ohio Fuel O. Co.	735	...	...	...	...
74	W. S. May No. 4	Duval	Ohio Fuel O. Co.	955	...	...	...	...
75	Oliver Hill No. 3	Duval	Big Cr. Dev. Co.	900	...	...	...	...
76	Thos. Fowler No. 4	Duval	Big Cr. Dev. Co.	930	350	2	...	...
77	Thos. Fowler No. 5	Duval	Big Cr. Dev. Co.	1000	395	8	...	...
78	Thos. Fowler No. 2	Duval	Big Cr. Dev. Co.	1015	...	...	...	...
79	Thos. Fowler No. 3	Duval	Big Cr. Dev. Co.	980	...	...	...	...
80	Thos. Fowler No. 1	Duval	Big Cr. Dev. Co.	1060	...	...	...	...
81	Thos. Fowler No. 6	Duval	Big Cr. Dev. Co.	1015	410	5	...	...
82	E. J. May No. 1	Duval	Ohio Fuel O. Co.	680L	...	...	175	2
83	E. J. May No. 2	Duval	Ohio Fuel O. Co.	855	...	...	...	...
84	E. J. May No. 3	Duval	Ohio Fuel O. Co.	840	...	...	370	2
85	E. J. May No. 4	Duval	Ohio Fuel O. Co.	845	...	...	375	2
86	E. J. May No. 6	Duval	Ohio Fuel O. Co.	790	...	...	...	...
87	E. J. May No. 8	Duval	Ohio Fuel O. Co.	760	...	...	270	3
88	E. J. May No. 10	Duval	Ohio Fuel O. Co.	850	...	...	...	...
89	E. J. May No. 11	Duval	Ohio Fuel O. Co.	700	133	5	...	...
90	E. J. May No. 14	Duval	Ohio Fuel O. Co.	695	...	...	...	...
91	E. J. May No. 15	Duval	Ohio Fuel O. Co.	755	...	...	...	...
92	E. J. May No. 13	Duval	Ohio Fuel O. Co.	715	...	...	210	5
93	E. J. May No. 12	Duval	Ohio Fuel O. Co.	695	...	...	...	...
94	Mason & Tackett	Duval	Big Cr. Dev. Co.	730	...	...	210	2
95	Mason & Tackett	Duval	Big Cr. Dev. Co.	725	95	3	...	...
96	Mason & Tackett	Duval	Big Cr. Dev. Co.	820	...	...	...	...
97	Oliver Hill No. 2	Duval	Big Cr. Dev. Co.	705	...	...	...	...
98	Oliver Hill No. 1	Duval	Big Cr. Dev. Co.	705	150	2	...	...
99	Oliver Hill No. 5	Duval	Big Cr. Dev. Co.	820	...	...	...	...
100	Thos. Cooper No. 1	Duval	Big Cr. Dev. Co.	815	...	...	...	...
101	Thos. Cooper No. 2	Duval	Big Cr. Dev. Co.	840	...	...	...	...
102	Thos. Cooper No. 3	Duval	Big Cr. Dev. Co.	920	...	...	397	1
103	Thos. Cooper No. 4	Duval	Big Cr. Dev. Co.	945	...	...	425	1
104	Oliver Hill No. 6	Duval	Big Cr. Dev. Co.	915	315	...	...	...
105	John Fowler	Duval	Big Cr. Dev. Co.	985	...	...	440	5
106	H. E. Ridenhour No. 1	Duval	Big Cr. Dev. Co.	1025	...	...	446	2
107	H. E. Ridenhour No. 2	Duval	Big Cr. Dev. Co.	970	305	5	...	...
108	Oliver Hill No. 4	Duval	Big Cr. Dev. Co.	1010	410	2	...	...
109	Jas. White No. 4	Duval	Holly O. & Dev. Co.	1005	...	...	...	...
110	Wm. Kelting No. 1	Duval	Big Cr. Dev. Co.	1085	...	...	...	...
111	Jas. White No. 1	Duval	Holly O. & Dev. Co.	860	...	...	330	5
112	Jas. White No. 2	Duval	Holly O. & Dev. Co.	830	...	...	...	...
113	Jas. White No. 3	Duval	Holly O. & Dev. Co.	1015	...	...	...	...
114	Robt. Huffman No. 2	Duval	Big Cr. Dev. Co.	1000	320	3	...	...
115	Benj. Oxley No. 1	Duval	Big Cr. Dev. Co.	1000	357	3	...	...
116	Schmidt & Kremer No. 3	Duval	Big Cr. Dev. Co.	990	397	3	...	...
117	Thos. Nelson No. 1	Duval	Big Cr. Dev. Co.	990	...	...	...	...
118	Schmidt & Kremer No. 2	Duval	Big Cr. Dev. Co.	920	351	3	...	...
119	Schmidt & Kremer No. 1	Duval	Big Cr. Dev. Co.	970	...	...	...	...
120	Jos. Holton No. 1	Duval	Holly O. & Dev. Co.	1040	...	...	...	...
121	Jos. Holton No. 2	Duval	Holly O. & Dev. Co.	1030	...	...	...	...
122	Jos. Holton No. 3	Duval	Holly O. & Dev. Co.	955	...	...	...	...
123	Jas. Lawson No. 2	Duval	Holly O. & Dev. Co.	1010	320	3	...	...
124	Will Kerns No. 1	Duval	Big Cr. Dev. Co.	1060	...	...	450	2
125	Benj. Kerns No. 1	Duval	Big Cr. Dev. Co.	955	...	...	...	...
126	Benj. Kerns No. 2	Duval	Big Cr. Dev. Co.	1060	...	...	...	...

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
.....	.....	.....	.....	.....	.....	2381	24	2407	Berea, oil.....	64
1073	640	1756	180	2000	90	2429½	23½	2453	Berea, oil.....	65
.....	.....	1800	180	.....	.....	.....	22	2367	Berea, oil.....	66
1140	610	1812	198	2010	80	2482	21	2504½	Berea, oil.....	67
1095	670	1752	218	.....	.....	2488	24	2512	Berea, oil.....	68
1060	590	1680	225	1905	80	2467	22	2489	Berea, oil.....	69
950	652	1635	85	1720	60	2408	22	2430	Berea, oil; hole full water, 1110.....	70
.....	.....	.....	.....	.....	.....	2312	20½	2332½	Berea, oil; hole full water, 1025.....	71
.....	.....	.....	.....	.....	.....	2209	20	2229	Berea, oil.....	72
1100	617	1757	195	1952	53	2208½	24½	2233	Berea, oil.....	73
1015	635	1715	170	1885	85	2433	20½	2456	Berea, oil.....	74
1055	580	1715	180	1895	80	2386	21	2410	Berea, oil; show of gas, 1075.....	75
1105	655	1797	178	1975	70	2409	21	2430	Berea, oil; water, 1120.....	76
1125	625	1815	195	2010	70	2470	22	2492	Berea, oil.....	77
1080	650	1770	80	1850	80	2505	21	2526	Berea, oil; hole full water, 1205.....	78
1235	595	1875	185	2060	60	2460	19	2479	Berea, oil; hole full water, 1165.....	79
1130	560	1780	180	1975	65	2544	24	2571	Berea, oil; hole full water, 1270.....	80
880	560	1497	153	1700	50	2473	20	2493	Berea, oil.....	81
.....	.....	1660	200	1860	65	2168	20	2188	Berea, oil; 1st day, 60 bbls.....	82
990	470	1616	170	1786	75	2347	23	2370	Berea, oil.....	83
.....	.....	.....	.....	.....	.....	2312	23	2335	Berea, oil.....	84
910	635	.....	.....	1780	40	2315½	25½	2341	Berea, oil; 1st day, 40 bbls.....	85
.....	.....	.....	.....	.....	.....	2280	22	2313	Berea, oil; 1st day, 52 bbls.....	86
.....	.....	1690	215	2185	50	2268	20	2288	Berea, oil.....	87
810	669	1514	196	1710	70	2375	21½	2398	Berea, oil; water, 1050.....	88
850	645	1500	180	1680	65	2195	20	2217½	Berea, oil; water, 830, 895.....	89
940	400	1594	160	1754	60	2180½	22	2202½	Berea, oil; gas in B. L., 1638.....	90
910	600	1545	191	1736	60	2265½	22½	2285	Berea, oil.....	91
815	663	1513	185	1698	60	2229	21	2251	Berea, oil.....	92
970	613	1623	162	1785	60	2093	22	2119	Berea, oil.....	93
950	575	1610	190	1800	80	2304	21	2332	Berea, oil.....	94
1050	650	1740	175	1915	80	2281	21	2309	Berea, oil; water, 1050.....	95
840	645	1517	197	1714	71	2398	21	2419	Berea, oil; water, 1165.....	96
820	664	1484	220	1720	35	2203	20	2226½	Berea, oil.....	97
945	660	1655	180	1835	65	2210	20	2236	Berea, oil.....	98
945	645	1628	182	1810	75	2346	21	2367	Berea, oil; water, 1035.....	99
960	650	1668	182	1850	80	2325	21	2346	Berea, oil; water, 1010.....	100
1075	635	1750	190	1940	70	2355	22	2378	Berea, oil.....	101
1120	630	1812	185	1997	70	2450	21	2471	Berea, oil.....	102
1080	606	1725	175	1900	75	2497	21	2519	Berea, oil.....	103
1090	670	1818	182	2000	80	2424	22	2446	Berea, oil.....	104
1190	650	1875	150	2025	60	2505	22	2527	Berea, oil.....	105
1160	625	1830	185	2015	65	2552	20	2572	Berea, oil; little gas, 1145; big water, 1220.....	106
1135	675	1845	170	2015	65	2493	23	2516	Berea, oil.....	107
.....	.....	1816	174	1990	75	2521	21	2542	Berea, oil; gas, 1175.....	108
1160	680	1920	180	2100	70	2513	20	2536	Berea, oil; oil, 2517.....	109
.....	.....	1650	230	1880	50	2595	21	2616	Berea, oil.....	110
983	647	1630	210	1840	80	2373	18	2400	Berea, oil; oil top of Berea.....	111
.....	.....	.....	.....	.....	.....	2342	18	2366	Berea, oil.....	112
1160	630	1840	190	2030	65	.....	.....	.....	Berea, oil.....	113
1090	630	1759	196	1955	62	2511	22	2533	Berea, oil.....	114
1140	610	1810	190	2000	60	2445	20	2465	Berea, oil.....	115
1140	650	1825	175	2000	55	2481	21	2504	Berea, oil.....	116
1090	630	1759	196	1955	62	2516	20	2536	Berea, oil.....	117
1105	670	1807	173	1980	60	2445	20	2465	Berea, oil.....	118
1175	655	1867	192	2065	55	2424	20	2453	Berea, oil; gas, 1215 in lime.....	119
1170	503	1880	185	2065	56	2492	24	2523	Berea, oil.....	120
1075	605	1755	190	1945	50	2561	23	2584	Berea, oil.....	121
1175	645	1855	180	2035	63	2543	20	2565	Berea, oil.....	122
1220	652	1910	180	2090	60	2453	18	2471	Berea, oil.....	123
1105	665	1803	182	1985	50	2539	22	2561	Berea, oil; gas in B. L.....	124
1277	603	1922	208	2130	65	2595	22	2617	Berea, oil; gas in Salt sand.....	125
.....	.....	.....	.....	.....	.....	2487	22	2511	Berea, oil; gas, 1840.....	126
.....	.....	.....	.....	.....	.....	2596	22	2618	.....	.....

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
127	J. W. Curnes No. 2.....	Duval.....	Big Cr. Dev. Co.....	860	.....	.....	.....	.....
128	J. W. Curnes No. 3.....	Duval.....	Big Cr. Dev. Co.....	1025	.....	.....	.....	.....
129	J. W. Curnes No. 4.....	Duval.....	Big Cr. Dev. Co.....	1065	.....	.....	.....	.....
130	Jas. Lawson No. 3.....	Duval.....	Holly Oil & Dev. Co.....	935	325	5	.....	.....
131	Jas. Lawson No. 4.....	Duval.....	Holly Oil & Dev. Co.....	915	.....	.....	.....	.....
132	Jas. Lawson No. 1.....	Duval.....	Holly Oil & Dev. Co.....	755	.....	.....	.....	.....
133	M. V. Lawson No. 1.....	Duval.....	Holly Oil & Dev. Co.....	805	.....	.....	.....	.....
134	Robt. Huffman No. 1.....	Duval.....	Big Cr. Dev. Co.....	760	.....	.....	.....	.....
135	Edward May No. 1.....	Duval.....	Big Cr. Dev. Co.....	755	.....	.....	.....	.....
136	Edward May No. 2.....	Duval.....	Big Cr. Dev. Co.....	920	.....	.....	.....	.....
137	Edward May No. 5.....	Duval.....	Big Cr. Dev. Co.....	1010	.....	.....	.....	.....
138	Edward May No. 4.....	Duval.....	Big Cr. Dev. Co.....	825	270	3	.....	.....
139	Edward May No. 3.....	Duval.....	Big Cr. Dev. Co.....	775	.....	.....	.....	.....
140	Morrison Heirs No. 1.....	Duval.....	United Fuel Co.....	720	.....	.....	.....	.....
141	Emily Morrison No. 1.....	Duval.....	United Fuel Co.....	850	.....	.....	.....	.....
142	Morrison Heirs No. 2.....	Duval.....	United Fuel Co.....	715	.....	.....	.....	.....
143	Emily Morrison No. 2.....	Duval.....	United Fuel Co.....	900	.....	.....	.....	.....
144	Emily Morrison No. 3.....	Duval.....	United Fuel Co.....	820	.....	.....	.....	.....
145	Emily Morrison No. 4.....	Duval.....	United Fuel Co.....	940	.....	.....	.....	.....
146	Emily Morrison No. 5.....	Duval.....	United Fuel Co.....	935	320	4	.....	.....
147	Emily Morrison No. 6.....	Duval.....	United Fuel Co.....	955	360	4	.....	.....
148	Emily Morrison No. 7.....	Duval.....	United Fuel Co.....	1000	360	5	.....	.....
149	Emily Morrison No. 8.....	Duval.....	United Fuel Co.....	815	220	5	.....	.....
150	Emily Morrison No. 9.....	Duval.....	United Fuel Co.....	1000	360	5	.....	.....
151	Emily Morrison No. 10.....	Duval.....	United Fuel Co.....	780	.....	.....	.....	.....
152	Emily Morrison No. 11.....	Duval.....	United Fuel Co.....	760	.....	.....	.....	.....
153	Emily Morrison No. 12.....	Duval.....	United Fuel Co.....	760	.....	.....	.....	.....
154	Emily Morrison No. 13.....	Duval.....	United Fuel Co.....	755	.....	.....	.....	.....
155	Emily Morrison No. 14.....	Duval.....	United Fuel Co.....	880	.....	.....	.....	.....
156	Jas. Strickler No. 1.....	Duval.....	United Fuel Co.....	930	360	7(?)	.....	.....
157	Jas. Strickler No. 2.....	Duval.....	United Fuel Co.....	1130	.....	.....	.....	.....
158	Jas. Strickler No. 3.....	Duval.....	United Fuel Co.....	920	.....	.....	.....	.....
159	Jas. Strickler No. 4.....	Duval.....	United Fuel Co.....	900	.....	.....	350	5
160	Jas. Strickler No. 5.....	Duval.....	United Fuel Co.....	915	.....	.....	.....	.....
161	Page Thornton No. 1.....	Duval.....	.....	680L	.....	.....	.....	.....
162	Ephriam White No. 1.....	Duval.....	.....	735	.....	.....	.....	.....
163	Columbus Griffith No. 1.....	Duval.....	Big Creek Dev. Co.....	900	.....	.....	348	.....
164	Columbus Griffith No. 2.....	Duval.....	Big Creek Dev. Co.....	700	.....	.....	140	2
165	Joab Fowler No. 2.....	Duval.....	Big Creek Dev. Co.....	940	.....	.....	.....	.....
166	Columbus Griffith No. 3.....	Duval.....	Big Creek Dev. Co.....	725	.....	.....	160	2
167	Joab Fowler No. 3.....	Duval.....	Big Creek Dev. Co.....	790	.....	.....	211	2
168	Joab Fowler No. 4.....	Duval.....	Big Creek Dev. Co.....	835	320	5	.....	.....
169	Joab Fowler No. 5.....	Duval.....	Big Creek Dev. Co.....	875	.....	.....	.....	.....
170	Joab Fowler No. 6.....	Duval.....	Big Creek Dev. Co.....	965	.....	.....	460	3
171	Joab Fowler No. 1.....	Duval.....	Big Creek Dev. Co.....	955	378	2	.....	.....
172	Robt. Fowler No. 3.....	Duval.....	Big Creek Dev. Co.....	985	430	3	.....	.....
173	Robt. Fowler No. 1.....	Duval.....	Big Creek Dev. Co.....	975	416	4	.....	.....
174	Robt. Fowler No. 2.....	Duval.....	Big Creek Dev. Co.....	960	410	3	.....	.....
175	Robt. Fowler No. 4.....	Duval.....	Big Creek Dev. Co.....	950	405	5	.....	.....
176	Ephriam Griffith No. 1.....	Duval.....	Big Creek Dev. Co.....	830	265	.....	.....	.....
177	Ephriam Griffith No. 2.....	Duval.....	Big Creek Dev. Co.....	765	.....	.....	.....	.....
178	Ephriam Griffith No. 3.....	Duval.....	Big Creek Dev. Co.....	715	.....	.....	182	1
179	Ephriam Griffith No. 4.....	Duval.....	Big Creek Dev. Co.....	795	.....	.....	.....	.....
180	Ephriam Griffith No. 5.....	Duval.....	Big Creek Dev. Co.....	905	.....	.....	.....	.....
181	E. P. Bell No. 4.....	Duval.....	Big Creek Dev. Co.....	945	.....	.....	404	6
182	E. P. Bell No. 1.....	Duval.....	Big Creek Dev. Co.....	855	.....	.....	.....	.....
183	E. P. Bell No. 2.....	Duval.....	Big Creek Dev. Co.....	900	295	2	.....	.....
184	E. P. Bell No. 5.....	Duval.....	Big Creek Dev. Co.....	1000	.....	.....	.....	.....
185	E. P. Bell No. 3.....	Duval.....	Big Creek Dev. Co.....	990	.....	.....	.....	.....
186	E. P. Bell No. 6.....	Duval.....	Big Cr. Dev. Co.....	960	350	3	.....	.....
187	E. G. Griffith No. 1.....	Duval.....	South Penn O. Co.....	825	.....	.....	.....	.....
188	E. G. Griffith No. 2.....	Duval.....	South Penn O. Co.....	950	.....	.....	.....	.....
189	E. G. Griffith No. 3.....	Duval.....	South Penn O. Co.....	1005	.....	.....	.....	.....

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
1080	610	1725	180	1905	80	2407	19	2428	Berea, oil.....	127
1245	550	1875	180	2055	70	2563	22	2585	Berea, oil.....	128
1060	640	1935	185	2120	50	2621	22	2644	Berea, oil.....	129
1130	640	1807	187	1994	96	2470	25	2495	Berea, oil.....	130
1130	500	1780	180	1966	55	2452	26	2478	Berea, oil.....	131
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	132
1100	548	1734	194	1928	52	2422	18	2440	Berea, oil.....	133
877	643	1555	180	1755	55	2237	20	2264	Berea, oil.....	134
890	660	1990	166	1756	79	2255	20	2287	Berea, oil; gas, 1750.....	135
1030	655	1741	173	1904	55	2397	21	2422	Berea, oil; show gas in B. L.....	136
1170	611	1826	180	2006	59	2508	22	2530	Berea, oil; water, 1220.....	137
925	655	1630	170	1800	65	2308	21	2339	Berea, oil; water, 975.....	138
920	630	1595	200	1795	63	2279	20	2299	Berea, oil.....	139
.....	.....	.....	.....	.....	.....	2203	21	2224	Berea, oil.....	140
.....	.....	.....	.....	.....	.....	2364	22	2386	Berea, oil.....	141
800	540	1525	180	1725	60	2198	21	2222	Berea, oil.....	142
1070	650	1750	185	1935	90	2423	22	2447	Berea, oil.....	143
1050	230	1678	187	1865	60	2356	23	2379	Berea, oil.....	144
1090	621	1758	170	1928	84	2433	21	2454	Berea, oil.....	145
1106	619	1765	175	1940	60	2452	21	2478	Berea, oil.....	146
1160	600	1816	150	2021	20	2499	18	2522	Berea, oil.....	147
1140	650	1822	178	2000	60	2500	22	2522	Berea, oil.....	148
1060	585	1702	165	1867	60	2384	20	2404	Berea, oil.....	149
1140	650	1835	165	2000	60	2506	20½	2526½	Berea, oil.....	150
935	625	1600	160	1760	55	2280	22	2305	Berea, oil.....	151
945	610	1595	180	1775	498	2273	22	2295	Berea, oil.....	152
920	630	1585	180	1765	60	2270	21	2291	Berea, oil.....	153
960	635	1648	162	1810	60	2326	21	2347	Berea, oil.....	154
970	605	1610	170	1780	70	2287	23	2310	Berea, oil.....	155
1090	600	1756	169	1925	70	2436	23	2461	Berea, oil.....	156
1280	640	1963	150	2113	47	2636	23	2659	Berea, oil.....	157
1054	655	1755	180	1935	60	2431	23	2454	Berea, oil.....	158
1055	620	1724	171	1895	70	2399	20	2421	Berea, oil; gas, 6 mil. in B. L.....	159
1070	570	1737	163	1900	70	2415	19	2434	Berea, oil.....	160
.....	.....	1375	220	1595	40	2096	15	2111	Berea, oil; gas, 1,089,000 B. L.....	161
900	555	1455	235	1690	42	2183	20	2203	Berea, oil; gas in 117'.....	162
1020	655	1710	190	1900	80	2401	22	2423	Berea, oil; water, 880.....	163
750	665	1505	190	1695	60	2185	21	2210	Berea, oil.....	164
1090	600	1760	190	1950	75	2452	20	2472	Berea, oil.....	165
820	595	1510	185	1695	60	2206	21	2229	Berea, oil; gas, 1635'.....	166
900	590	1580	185	1765	70	2282	22	2304	Berea, oil; water, 890.....	167
920	630	1650	180	1830	75	2331	23	2354	Berea, oil.....	168
1105	.....	.....	.....	.....	.....	.....	.....	1136	Berea, oil; gas in Salt sand.....	169
1060	590	1780	185	1965	75	2461	21	2482	Berea, oil.....	170
1115	585	1810	195	2005	70	2485	22	2509	Berea, oil.....	171
1120	590	1820	180	1990	70	2498	20	2518	Berea, oil.....	172
1120	600	1805	185	1990	75	2479	21	2500	Berea, oil.....	173
1090	650	1800	180	1980	80	2478	21	2499	Berea, oil.....	174
1130	580	1798	175	1973	80	2488	20	2508	Berea, oil.....	175
900	580	1605	185	1790	60	2295	20	2319	Berea, oil; water, 980.....	176
860	580	1530	185	1725	60	2228	22	2250	Berea, oil; gas, 1680.....	177
765	560	1485	185	1670	70	2182	24	2206	Berea, oil; water, 820.....	178
925	615	1590	190	1780	70	2264	18	2283	Berea, oil; water, 960.....	179
970	635	1710	180	1890	45	2382	21	2403	Berea, oil.....	180
1005	640	1740	190	1930	170	2422	24	2447	Berea, oil.....	181
920	660	1642	180	1822	75	2333	20	2353	Berea, oil; water, 1020.....	182
1000	595	1690	180	1870	75	2378	21	2399	Berea, oil; water, 1060.....	183
1085	615	1800	185	1985	55	2486	21	2507	Berea, oil.....	184
1105	595	1795	180	1975	70	2473	21	2496	Berea, oil.....	185
1000	640	1732	180	1732	55	2438	21	2459	Berea, oil.....	186
915	620	1630	180	1810	180	2294	22	2316	Berea, oil.....	187
990	675	1755	185	1940	80	2420	22	2442	Berea, oil.....	188
1100	675	1860	180	2040	90	2520	22	2542	Berea, oil.....	189

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
190	E. G. Griffith No. 4.....	Duval.....	South Penn O. Co.....	935	.....	.....	.....	.....
191	E. G. Griffith No. 5.....	Duval.....	South Penn O. Co.....	855	.....	.....	.....	.....
192	E. G. Griffith No. 6.....	Duval.....	South Penn O. Co.....	730	.....	.....	.....	.....
193	E. G. Griffith No. 7.....	Duval.....	South Penn O. Co.....	995	.....	.....	.....	.....
194	E. P. Bell No. 7.....	Duval.....	Big Cr. Dev. Co.....	1010	.....	.....	.....	.....
195	M. A. & T. A. Griffith No. 11.	Duval.....	Big Cr. Dev. Co.....	705	.....	.....	.....	.....
196	M. A. & T. A. Griffith No. 10.	Duval.....	Big Cr. Dev. Co.....	765	.....	.....	.....	.....
197	M. A. & T. A. Griffith No. 9.	Duval.....	Big Cr. Dev. Co.....	935	.....	.....	.....	.....
198	M. A. & T. A. Griffith No. 7.	Duval.....	Big Cr. Dev. Co.....	985	.....	.....	.....	.....
199	M. A. & T. A. Griffith No. 6.	Duval.....	Big Cr. Dev. Co.....	960	.....	.....	.....	.....
200	M. A. & T. A. Griffith No. 18.	Duval.....	Big Cr. Dev. Co.....	850	.....	.....	.....	.....
201	M. A. & T. A. Griffith No. 5.	Duval.....	Big Cr. Dev. Co.....	930	.....	.....	.....	.....
202	M. A. & T. A. Griffith No. 2.	Duval.....	Big Cr. Dev. Co.....	735	.....	.....	.....	.....
203	M. A. & T. A. Griffith No. 17.	Duval.....	Big Cr. Dev. Co.....	730	.....	.....	160	5
204	M. A. & T. A. Griffith No. 1.	Duval.....	Big Cr. Dev. Co.....	755	.....	.....	.....	.....
205	M. A. & T. A. Griffith No. 3.	Duval.....	Big Cr. Dev. Co.....	885	.....	.....	.....	.....
206	M. A. & T. A. Griffith No. 4.	Duval.....	Big Cr. Dev. Co.....	1045	.....	.....	.....	.....
207	M. A. & T. A. Griffith No. 8.	Duval.....	Big Cr. Dev. Co.....	1035	.....	.....	.....	.....
208	M. A. & T. A. Griffith No. 16.	Duval.....	Big Cr. Dev. Co.....	865	.....	.....	.....	.....
209	M. A. & T. A. Griffith No. 12.	Duval.....	Big Cr. Dev. Co.....	945	.....	.....	.....	.....
210	M. A. & T. A. Griffith No. 14.	Duval.....	Big Cr. Dev. Co.....	830	200	5	.....	.....
211	M. A. & T. A. Griffith No. 13.	Duval.....	Big Cr. Dev. Co.....	945	300	3	.....	.....
212	M. A. & T. A. Griffith No. 15.	Duval.....	Big Cr. Dev. Co.....	940	.....	.....	.....	.....
213	A. P. Oxley No. 2.....	Duval.....	Big Cr. Dev. Co.....	720	.....	.....	180	5
214	A. P. Oxley No. 1.....	Duval.....	Big Cr. Dev. Co.....	825	.....	.....	.....	.....
215	A. P. Oxley No. 3.....	Duval.....	Big Cr. Dev. Co.....	830	.....	.....	.....	.....
216	A. P. Oxley No. 4.....	Duval.....	Big Cr. Dev. Co.....	975	.....	.....	400	5
217	A. P. Oxley No. 5.....	Duval.....	Big Cr. Dev. Co.....	1180	560	5	.....	.....
218	W. T. Bell No. 6.....	Duval.....	Big Cr. Dev. Co.....	800	.....	.....	.....	.....
219	W. T. Bell No. 2.....	Duval.....	Big Cr. Dev. Co.....	840	.....	.....	.....	.....
220	W. McClure No. 4.....	Duval.....	Big Cr. Dev. Co.....	910	.....	.....	.....	.....
221	F. M. Midkiff No. 5.....	Duval.....	Big Cr. Dev. Co.....	935	.....	.....	.....	.....
222	F. M. Midkiff No. 4.....	Duval.....	Big Cr. Dev. Co.....	935	.....	.....	.....	.....
223	A. P. Wade No. 1.....	Duval.....	Big Cr. Dev. Co.....	930	.....	.....	.....	.....
224	F. M. Midkiff No. 3.....	Duval.....	Big Cr. Dev. Co.....	860	.....	.....	.....	.....
225	Jas. Brown No. 1.....	Duval.....	South Penn O. Co.....	1205	.....	.....	.....	.....
226	W. T. Bell No. 4.....	Duval.....	Big Cr. Dev. Co.....	940	.....	.....	.....	.....
227	W. T. Bell No. 3.....	Duval.....	Big Cr. Dev. Co.....	990	.....	.....	.....	.....
228	John Stephens No. 13.....	Duval.....	Big Cr. Dev. Co.....	1145	.....	.....	.....	.....
229	W. T. Bell No. 5.....	Duval.....	Big Cr. Dev. Co.....	730	.....	.....	.....	.....
230	W. T. Bell No. 1.....	Duval.....	Big Cr. Dev. Co.....	739L	.....	.....	.....	.....
231	School Property.....	Duval.....	Big Cr. Dev. Co.....	738L	.....	.....	.....	.....
232	M. McClure No. 1.....	Duval.....	Big Cr. Dev. Co.....	765	.....	.....	.....	.....
233	M. McClure No. 6.....	Duval.....	Big Cr. Dev. Co.....	780	.....	.....	.....	.....
234	M. McClure No. 5.....	Duval.....	Big Cr. Dev. Co.....	765	.....	.....	.....	.....
235	M. McClure No. 2.....	Duval.....	Big Cr. Dev. Co.....	730	.....	.....	.....	.....
236	Weaver McClure No. 1.....	Duval.....	C. C. Chamberlain.....	750	.....	.....	.....	.....
237	Weaver McClure No. 2.....	Duval.....	C. C. Chamberlain.....	835	.....	.....	.....	.....
238	Weaver McClure No. 3.....	Duval.....	C. C. Chamberlain.....	750	.....	.....	.....	.....
239	Weaver McClure No. 4.....	Duval.....	C. C. Chamberlain.....	915	.....	.....	.....	.....
240	E. M. Midkiff No. 1.....	Duval.....	Big Cr. Dev. Co.....	775	.....	.....	164	1
241	E. M. Midkiff No. 2.....	Duval.....	Big Cr. Dev. Co.....	885	.....	.....	.....	.....
242	E. M. Midkiff No. 6.....	Duval.....	Big Cr. Dev. Co.....	875	.....	.....	.....	.....
243	E. M. Midkiff No. 7.....	Duval.....	Big Cr. Dev. Co.....	860	.....	.....	.....	.....
244	E. M. Midkiff No. 8.....	Duval.....	Big Cr. Dev. Co.....	915	.....	.....	.....	.....
245	Dora Clark No. 1.....	Duval.....	Big Cr. Dev. Co.....	1015	320	5	.....	.....
246	Alice Hudson No. 1.....	Duval.....	.....	1015	.....	.....	.....	.....
247	A. C. Hilbert No. 5.....	Duval.....	South Penn O. Co.....	1030	.....	.....	.....	.....
248	A. C. Hilbert No. 3.....	Duval.....	South Penn O. Co.....	1000	.....	.....	.....	.....
249	Albert Purdy.....	Duval.....	South Penn O. Co.....	1025	.....	.....	.....	.....
250	A. C. Hilbert No. 2.....	Duval.....	South Penn O. Co.....	990	.....	.....	.....	.....
251	John McElroy No. 1.....	Duval.....	South Penn O. Co.....	1000	.....	.....	.....	.....
252	A. C. Hilbert No. 4.....	Duval.....	South Penn O. Co.....	925	.....	.....	.....	.....

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
1020	650	1750	192	1942	80	2419	18	2437	Berea, oil.....	190
945	595	1652	180	1837	73	2352	24	2376	Berea, oil.....	191
795	616	1497	193	1710	69	2190	20	2212	Berea, oil.....	192
895	615	1600	185	1755	80	2275	24	2299	Berea, oil.....	193
1070	650	1800	180	1980	50	2459	19	2508	Berea, oil.....	194
825	585	1517	180	1697	60	2191	20	2211	Berea, oil.....	195
795	705	1545	210	1755	80	2220	20	2246	Berea, oil.....	196
990	681	1719	180	1899	70	2390	22	2412	Berea, oil; water, 1090.....	197
1080	530	1793	137	.....	.....	2463	21	2484	Berea, oil.....	198
1020	540	1753	177	.....	.....	2424	24	2448	Berea, oil.....	199
900	665	1637	180	.....	.....	2316	20	2336	Berea, oil.....	200
980	660	1715	204	.....	.....	2389	20	2409	Berea, oil.....	201
845	650	1575	205	.....	.....	2270	20	2294	Berea, oil.....	202
860	600	1496	190	1686	60	2179½	23	2202½	Berea, oil.....	203
820	650	1558	202	1760	60	2233	20	2257	Berea, oil; water, 865'.....	204
880	640	1625	215	1840	70	2339	23	2362	Berea, oil.....	205
1110	680	1855	175	2030	60	2531	19	2550	Berea, oil; water, 1140.....	206
1160	640	1840	175	2015	85	2526	19	2547	Berea, oil.....	207
1000	533	1680	190	1870	65	2358	17	2375	Berea, oil.....	208
960	650	1734	171	1905	60	2400	20	2420	Berea, oil; water, 1070.....	209
885	701	1628	180	.....	.....	2307	18	2327	Berea, oil.....	210
1000	700	1741	185	1926	60	2417	18	2425	Berea, oil.....	211
1200	560	1865	185	2050	60	2535	20	2558	Berea, oil; water, 2150.....	212
800	660	1520	190	1710	80	2202	18	2222	Berea, oil.....	213
1000	560	1630	175	1805	90	2203	17	2220	Berea, oil; water, 1010.....	214
940	620	1615	177	1792	43	2321	15	2336	Berea, oil; water, 990.....	215
1010	655	1775	180	1955	75	2455	18	2475	Berea, oil.....	216
1200	680	1975	190	2165	80	2666	18	2684	Berea, oil.....	217
940	550	1610	180	1790	60	2303	20	2323	Berea, oil.....	218
990	620	1647	185	1832	53	2330	19	2349	Berea, oil; water, 1010.....	219
1035	621	1708	180	1888	80	2391	21	2412	Berea, oil.....	220
1095	570	1750	185	1935	80	2430	20	2454	Berea, oil.....	221
1000	570	1670	180	1850	60	2363	19	2388	Berea, oil.....	222
1080	600	1710	195	1905	60	2406	18	2424	Berea, oil.....	223
1040	600	1730	185	1915	50	2413	18	2431	Berea, oil; water, 1100.....	224
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	225
1060	620	1765	185	1950	70	2445	21	2466	Berea, oil.....	226
1150	550	1800	180	1980	70	2498	20	2518	Berea, oil; water, 1200.....	227
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	228
850	570	1515	185	1700	95	2203	16	2223	Berea, oil; water, 910.....	229
870	595	1511	189	1700	50	2202	14	2216	Berea, oil.....	230
880	590	1475	215	1690	80	2200	14	2216	Berea, oil.....	231
910	300	1514	241	1755	60	2234	12	2257	Berea, oil; water, 910.....	232
940	590	1600	193	1793	60	2272	17	2289	Berea, oil.....	233
795	685	1563	212	1775	80	2242	16	2261	Berea, oil.....	234
870	200	1495	200	1695	65	2218	20	2240	Berea, oil.....	235
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	236
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	237
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	238
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	239
870	570	1545	185	1730	70	2244	19	2263	Berea, oil.....	240
1010	580	1675	185	1860	50	2363	20	2386	Berea, oil; water, 1060.....	241
960	605	1650	190	1840	90	2335	19	2360	Berea, oil.....	242
900	685	1643	180	1823	80	2327	22	2349	Berea, oil.....	243
1085	605	1750	190	1940	70	2446	21	2467	Berea, oil.....	244
850	610	1535	195	1730	50	2215	18	2235	Berea, oil; water, 910.....	245
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil.....	246
1090	630	1828	182	2010	75	2521	28	2549	Berea.....	247
1080	655	1780	86	1966	68	2472	20	2492	Berea.....	248
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea.....	249
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea.....	250
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea.....	251
1015	644	1704	188	1892	68	2385	21	2406	Berea.....	252

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
253	A. C. Hilbert No. 1.....	Duval.....	South Penn O. Co.....	915	.....	.....	.....	.....
254	Creed Kingery No. 4.....	Duval.....	Big Cr. Dev. Co.....	855	.....	.....	.....	.....
255	Creed Kingery No. 1.....	Duval.....	Big Cr. Dev. Co.....	900	.....	.....	300	2
256	Creed Kingery No. 2.....	Duval.....	Big Cr. Dev. Co.....	780	.....	.....	.....	.....
257	Creed Kingery No. 3.....	Duval.....	Big Cr. Dev. Co.....	815	.....	.....	.....	.....
258	John McElroy No. 3.....	Duval.....	Big Cr. Dev. Co.....	1010	.....	.....	.....	.....
259	Ira Hill No. 1.....	Duval.....	..... Dev. Co.....	1070	.....	.....	.....	.....
260	..... Jones.....	Duval.....	.....	840	.....	.....	.....	.....
261	..... Jones.....	Duval.....	.....	1115	.....	.....	.....	.....
262	Horse Creek No. 1.....	Duval.....	South Penn O. Co.....	760	.....	.....	.....	.....
263	Porter Cr. Oil Co.....	Duval.....	Porter Cr. O. Co.....	785	.....	.....	.....	.....
264	H. A. Hager Hrs. No. 1.....	Duval.....	Carter O. Co.....	745	.....	.....	.....	.....
265	H. A. Hager Hrs. No. 12.....	Duval.....	Carter O. Co.....	750	.....	.....	.....	.....
266	H. A. Hager Hrs. No. 2.....	Duval.....	Carter O. Co.....	875	.....	.....	.....	.....
267	H. A. Hager Hrs. No. 7.....	Duval.....	Carter O. Co.....	870	.....	.....	.....	.....
268	H. A. Hager Hrs. No. 8.....	Duval.....	Carter O. Co.....	925	.....	.....	.....	.....
269	J. F. Stephens No. 1.....	Duval.....	Big Cr. Dev. Co.....	790	.....	.....	.....	.....
270	H. A. Hager Hrs. No. 5.....	Duval.....	Carter O. Co.....	840	.....	.....	.....	.....
271	H. A. Hager Hrs. No. 11.....	Duval.....	Carter O. Co.....	950	.....	.....	375	6
272	H. A. Hager Hrs. No. 9.....	Duval.....	Carter O. Co.....	1015	.....	.....	.....	.....
273	H. A. Hager Hrs. No. 4.....	Duval.....	Carter O. Co.....	1030	.....	.....	480	5
274	H. A. Hager Hrs. No. 10.....	Duval.....	Carter O. Co.....	950	.....	.....	.....	.....
275	H. A. Hager Hrs. No. 3.....	Duval.....	Carter O. Co.....	750	.....	.....	.....	.....
276	H. A. Hager Hrs. No. 6.....	Duval.....	Carter O. Co.....	800	.....	.....	.....	.....
277	J. F. Stephens No. 2.....	Duval.....	Big Cr. Dev. Co.....	920	.....	.....	450	1
278	J. F. Stephens No. 4.....	Duval.....	Big Cr. Dev. Co.....	880	300	5	.....	.....
279	J. F. Stephens No. 3.....	Duval.....	Big Cr. Dev. Co.....	710L	130	1	.....	.....
280	Albert Hill No. 1.....	Duval.....	Big Cr. Dev. Co.....	785	230	2	.....	.....
281	Albert Hill No. 2.....	Duval.....	Big Cr. Dev. Co.....	730	160	3	.....	.....
282	Albert Hill No. 3.....	Duval.....	Big Cr. Dev. Co.....	905	330	5	.....	.....
283	W. I. Wade No. 1.....	Duval.....	Big Cr. Dev. Co.....	840	240	2	.....	.....
284	Ellen Workman No. 1.....	Duval.....	Big Cr. Dev. Co.....	800	.....	.....	.....	.....
285	Ellen Workman No. 2.....	Duval.....	Big Cr. Dev. Co.....	980	.....	.....	.....	.....
286	Ellen Workman No. 3.....	Duval.....	Big Cr. Dev. Co.....	1100	.....	.....	.....	.....
287	Ellen Workman No. 4.....	Duval.....	Big Cr. Dev. Co.....	1135	.....	.....	.....	.....
288	Ellen Workman No. 5.....	Duval.....	Big Cr. Dev. Co.....	1115	.....	.....	.....	.....
289	Ellen Workman No. 6.....	Duval.....	Big Cr. Dev. Co.....	975	.....	.....	.....	.....
290	A. G. Grass No. 7.....	Duval.....	Big Cr. Dev. Co.....	1100	485	2	.....	.....
291	A. G. Grass No. 2.....	Duval.....	Big Cr. Dev. Co.....	1090	495	2	.....	.....
292	A. G. Grass No. 6.....	Duval.....	Big Cr. Dev. Co.....	1115	.....	.....	.....	.....
293	A. G. Grass No. 5.....	Duval.....	Big Cr. Dev. Co.....	1100	.....	.....	.....	.....
294	A. G. Grass No. 4.....	Duval.....	Big Cr. Dev. Co.....	1090	.....	.....	.....	.....
295	A. G. Grass No. 3.....	Duval.....	Big Cr. Dev. Co.....	990	.....	.....	.....	.....
296	Octave Hager No. 2.....	Duval.....	Big Cr. Dev. Co.....	1050	.....	.....	.....	.....
297	Octave Hager No. 3.....	Duval.....	Big Cr. Dev. Co.....	1020	.....	.....	.....	.....
298	Sarepta Workman No. 2.....	Duval.....	Big Cr. Dev. Co.....	1105	.....	.....	.....	.....
299	Henry Miller No. 2.....	Duval.....	Big Cr. Dev. Co.....	1100	.....	.....	.....	.....
300	J. W. Stephens No. 7.....	Duval.....	Big Cr. Dev. Co.....	1135	.....	.....	.....	.....
301	Triangle Well.....	Duval.....	Titus et al.....	1125	.....	.....	.....	.....
302	M. E. Church North.....	Duval.....	Columbia G. & E. Co.....	672LC	.....	.....	190	2
303	Jas. May No. 1.....	Duval.....	Columbia G. & E. Co.....	650	.....	.....	.....	.....
304	J. L. King No. 21.....	Duval.....	Columbia G. & E. Co.....	667LC	.....	.....	170	4
305	J. L. King No. 30.....	Duval.....	Guyan O. Co.....	771LC	.....	.....	285	3
306	J. L. King No. 5.....	Duval.....	Guyan O. Co.....	731LC	.....	.....	.....	.....
307	J. L. King No. 8.....	Duval.....	Guyan O. Co.....	952LC	.....	.....	.....	.....
308	J. L. King No. 9.....	Duval.....	Guyan O. Co.....	1010LC	.....	.....	.....	.....
309	J. L. King No. 48.....	Duval.....	Guyan O. Co.....	952LC	.....	.....	.....	.....
310	J. L. King No. 49.....	Duval.....	Guyan O. Co.....	1051LC	.....	.....	.....	.....
311	J. L. King No. 50.....	Duval.....	Guyan O. Co.....	1000LC	.....	.....	.....	.....
312	Gordon Mason No. 7.....	Duval.....	Guyan O. Co.....	730	.....	.....	.....	.....
313	G. W. & E. Z. May No. 3.....	Duval.....	Guyan O. Co.....	760	.....	.....	.....	.....
314	Gordon Mason No. 15.....	Duval.....	Guyan O. Co.....	864LC	.....	.....	.....	.....
315	J. L. King No. 42.....	Duval.....	Guyan O. Co.....	912LC	.....	.....	345	3

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
1030	412	1695	180	1875	80	2379	22	2401	Berea	253
960	644	1657	185	1847	75	2337	20	2357	Berea, oil	254
1050	635	1725	180	1905	61	2421	22	2443	Berea, oil; water, 1120	255
1100	580	1724	180	1904	60	2404	21	2445	Berea, oil; water, 1120	256
1070	575	1705	159	1864	56	2385	23	2408	Berea, oil; water, 1100	257
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	258
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	259
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	260
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	261
815	675	1550	235	1800	55	2276	22	.....	Berea, oil	262
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	263
825	610	1530	180	1718	50	2222	23	2251	Berea, oil	264
835	615	1554	180	1734	70	2237	22	2260	Berea, oil	265
.....	.....	1669	181	1850	80	2356	20	2383	Berea, oil	266
950	610	1652	180	1832	60	2345	25	2373	Berea, oil	267
1030	600	1725	175	1900	80	2418	22	2441	Berea, oil	268
930	540	1595	190	1778	82	2313	20	2333	Berea, oil; water, 370	269
.....	.....	1650	170	1820	76	2311	20	2331	Berea, oil	270
1030	615	1760	170	1938	65	2441	22	2463	Berea, oil	271
1110	615	1831	135	2016	85	2510	21	2532	Berea, oil	272
.....	.....	.....	.....	2220	80	2535	23	2563	Berea, oil	273
1007	.....	1720	170	1890	75	2415	21	2437	Berea, oil	274
.....	.....	1541	179	1720	75	2220	20	2244	Berea, oil	275
850	636	1593	170	1763	70	2270	24	2302	Berea, oil	276
940	705	1695	190	1895	50	2386	21	2411	Berea, oil; water, 1050	277
910	620	1640	185	1823	80	2332	21	2355	Berea	278
715	633	1450	190	1650	50	2161	21	2182	Berea, oil; water, 825	279
820	690	1550	190	1740	70	2244	22	2266	Berea, oil; water, 910	280
790	610	1510	190	1700	90	2195	21	2218	Berea, oil; water, 880	281
930	635	1670	190	1860	40	2371	22	2392	Berea	282
860	640	1605	195	1800	90	2291	22	2315	Berea, oil; water, 960	283
910	632	1542	227	1769	80	2268	20	2293	Berea, oil	284
1100	630	1772	185	1971	60	2458	21	2481	Berea, oil	285
1205	647	1900	183	2100	70	2598	20	2623	Berea, oil; water, 1285	286
1250	595	1935	190	2125	60	2636	20	2656	Berea, oil; water, 1330	287
1200	605	1910	185	2095	80	2603	22	2625	Berea, oil; water, 1295	288
1110	590	1795	185	1980	60	2471	22	2493	Berea, oil	289
1180	665	1886	173	2059	53	2564	21	2585	Berea, oil	290
1160	590	1874	181	2055	65	2542	22	2564	Berea, oil; water, 1295	291
1210	626	1883	180	2063	40	2575	23	2603	Berea, oil	292
1165	335	1850	190	2040	75	2518	20	2538	Berea, oil; water, 1265	293
1150	595	1795	185	1980	50	2501	22	2521	Berea, oil; water, 1190	294
1105	640	1790	180	1970	55	2443	21	2473	Berea, oil; water, 1170	295
1160	630	1840	180	2020	55	2496	21	2522	Berea, oil; water, 1250	296
1105	620	1766	181	1947	65	2460	21	2481	Berea, oil; water, 1200	297
1200	621	1862	165	2027	55	2542	22	2564	Berea, oil	298
1173	507	1820	185	2005	60	2514	19	2533	Berea, oil	299
1205	615	1885	180	2065	80	2620	21	2641	Berea, oil	300
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, gas, 1 mil.	301
760	395	1431	169	1600	30	2107	21	2128	Berea, Rock p., 259 lbs.	302
780	595	.....	.....	1620	80	2093	21	2114	Berea, gas	303
850	560	1460	180	1640	50	2142	22	2167	Berea, oil, 30 bbl.; pay, 16	304
875	605	1564	190	1754	40	2235	22	2260	Berea, oil, 50 bbl.; pay, 12	305
835	605	1521	179	1708	47	2203	22	2225	Berea, oil, 25 bbl.; pay, 20	306
1225	315	1743	191	1934	30	2423	21	2444	Berea, oil, 25 bbl.; pay, 20	307
1110	475	1811	193	2004	41	2489	20	2509	Berea, oil, 18 bbl.; pay, 23	308
.....	.....	1745	195	1940	50	2428	24	2456	Berea, oil, 35 bbl.	309
1165	605	1845	190	2035	50	2520	26	2546	Berea, oil, 5 bbl.	310
1110	615	1805	185	1990	40	2462	26	2489	Berea, oil	311
.....	.....	.....	.....	.....	.....	.....	.....	.....	Berea, oil	312
.....	.....	.....	.....	.....	.....	2262	27	2289	Berea, oil, 25 bbl.	313
965	610	1654	186	1840	60	2340	22	2362	Berea, oil, 15 bbl.; pay, 26	314
1001	484	1704	192	1896	40	2387	26	2415	Berea, oil	315

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
316	J. L. King No. 41.....	Duval.....	Guyan O. Co.....	900LC	.....	.....	.....	.....
317	Gordon Mason No. 14.....	Duval.....	Guyan O. Co.....	978LC	.....	.....	.....	.....
318	J. L. King No. 24.....	Duval.....	Guyan O. Co.....	1114LC	.....	.....	.....	.....
319	J. L. King No. 12.....	Duval.....	Guyan O. Co.....	1110	.....	.....	.....	.....
320	C. W. & E. Z. May No. 1.....	Duval.....	Ohio Fuel O. Co.....	780	.....	.....	.....	.....
321	C. W. & E. Z. May No. 5.....	Duval.....	Ohio Fuel O. Co.....	865	.....	.....	.....	.....
322	C. W. & E. Z. May No. 6.....	Duval.....	Ohio Fuel O. Co.....	965	.....	.....	.....	.....
323	C. W. & E. Z. May No. 2.....	Duval.....	Ohio Fuel O. Co.....	890	.....	.....	.....	.....
324	C. W. & E. Z. May No. 11.....	Duval.....	Ohio Fuel O. Co.....	935	.....	.....	.....	.....
325	C. W. & E. Z. May No. 9.....	Duval.....	Ohio Fuel O. Co.....	865	.....	.....	.....	.....
326	C. W. & E. Z. May No. 10.....	Duval.....	Ohio Fuel O. Co.....	1025	.....	.....	.....	.....
327	C. W. & E. Z. May No. 15.....	Duval.....	Ohio Fuel O. Co.....	975	.....	.....	.....	.....
328	C. W. & E. Z. May No. 12.....	Duval.....	Ohio Fuel O. Co.....	1050	.....	.....	.....	.....
329	Benj. Burton No. 2.....	Duval.....	Duval O. Co.....	1050	.....	.....	.....	.....
330	C. W. & E. Z. May No. 13.....	Duval.....	Ohio Fuel O. Co.....	1075	.....	.....	.....	.....
331	Benj. Burton No. 6.....	Duval.....	Duval O. Co.....	1035	.....	.....	.....	.....
332	C. W. & E. Z. May No. 14.....	Duval.....	Ohio Fuel O. Co.....	1045	.....	.....	.....	.....
333	C. W. & E. Z. May No. 8.....	Duval.....	Ohio Fuel O. Co.....	895	.....	.....	.....	.....
334	Benj. Burton No. 7.....	Duval.....	Duval O. Co.....	1070	.....	.....	.....	.....
335	Benj. Burton No. 8.....	Duval.....	Duval O. Co.....	1115	.....	.....	.....	.....
336	Benj. Burton No. 9.....	Duval.....	Duval O. Co.....	1115	.....	.....	.....	.....
337	Benj. Burton No. 12.....	Duval.....	Duval O. Co.....	940	.....	.....	.....	.....
338	Benj. Burton No. 1.....	Duval.....	Duval O. Co.....	850	.....	.....	.....	.....
339	Benj. Burton No. 15.....	Duval.....	Duval O. Co.....	1045	.....	.....	.....	.....
340	Benj. Burton No. 19.....	Duval.....	Guyan O. Co.....	964L	.....	.....	.....	.....
341	Gordon Mason No. 45.....	Duval.....	Guyan O. Co.....	1053LC	.....	.....	.....	.....
342	Gordon Mason No. 44.....	Duval.....	Guyan O. Co.....	1017LC	.....	.....	.....	.....
343	Gordon Mason No. 43.....	Duval.....	Guyan O. Co.....	1040LC	.....	.....	.....	.....
344	Benj. Burton No. 17.....	Duval.....	Guyan O. Co.....	978LC	.....	.....	.....	.....
345	Benj. Burton No. 18.....	Duval.....	Guyan O. Co.....	929LC	.....	.....	.....	.....
346	Gordon Mason No. 21.....	Duval.....	Guyan O. Co.....	972LC	.....	.....	455	2
347	Gordon Mason No. 10.....	Duval.....	Guyan O. Co.....	830LC	.....	.....	.....	.....
348	Gordon Mason No. 13.....	Duval.....	Guyan O. Co.....	884LC	.....	.....	.....	.....
349	Gordon Mason No. 6.....	Duval.....	Guyan O. Co.....	736LC	.....	.....	.....	.....
350	Gordon Mason No. 4.....	Duval.....	Guyan O. Co.....	758LC	.....	.....	260	2
351	Gordon Mason No. —.....	Duval.....	Guyan O. Co.....	789LC	.....	.....	.....	.....
352	C. W. & E. Z. May No. 4.....	Duval.....	Ohio Fuel O. Co.....	1050	.....	.....	.....	.....
353	J. W. Stephens No. 2 U. T.....	Duval.....	Big Cr. O. & D. Co.....	810	.....	.....	280	2
354	J. W. Stephens No. 7 U. T.....	Duval.....	Big Cr. O. & D. Co.....	1060	.....	.....	.....	.....
355	J. W. Stephens No. 5 U. T.....	Duval.....	Big Cr. O. & D. Co.....	935	.....	.....	.....	.....
356	J. W. Stephens No. 6 U. T.....	Duval.....	Big Cr. O. & D. Co.....	715	.....	.....	190	2
357	J. W. Stephens No. 4 L. T.....	Duval.....	Big Cr. O. & D. Co.....	985	.....	.....	.....	.....
358	J. W. Stephens No. 3 L. T.....	Duval.....	Big Cr. O. & D. Co.....	975	.....	.....	.....	.....
359	J. W. Stephens No. 6 L. T.....	Duval.....	Big Cr. O. & D. Co.....	965	.....	.....	460	2
360	J. W. Stephens No. 9 L. T.....	Duval.....	Big Cr. O. & D. Co.....	965	.....	.....	.....	.....
361	J. W. Stephens No. 8 L. T.....	Duval.....	Big Cr. O. & D. Co.....	.....	.....	.....	.....	.....
362	J. W. Stephens No. 2 L. T.....	Duval.....	Big Cr. O. & D. Co.....	980	.....	.....	.....	.....
363	J. W. Stephens No. 5 L. T.....	Duval.....	Big Cr. O. & D. Co.....	1060	.....	.....	.....	.....
364	J. W. Stephens No. 1 L. T.....	Duval.....	Big Cr. O. & D. Co.....	745	.....	.....	.....	.....
365	C. C. Chambers No. 1.....	Duval.....	Big Cr. O. & D. Co.....	670	.....	.....	.....	.....
366	M. A. Spurlock No. 1.....	Duval.....	Big Cr. O. & D. Co.....	920	.....	.....	.....	.....
367	Leonard Oxley No. 1.....	Duval.....	Big Cr. O. & D. Co.....	1000	.....	.....	.....	.....
368	Leonard Oxley No. 2.....	Duval.....	Big Cr. O. & D. Co.....	945	.....	.....	.....	.....
369	Leonard Oxley No. 3.....	Duval.....	Big Cr. O. & D. Co.....	855	.....	.....	.....	.....
370	Leonard Oxley No. 4.....	Duval.....	Big Cr. O. & D. Co.....	1020	.....	.....	.....	.....
371	Leonard Oxley No. 5.....	Duval.....	Big Cr. O. & D. Co.....	1060	.....	.....	.....	.....
372	A. Hager No. 1.....	Duval.....	Big Cr. O. & D. Co.....	895	.....	.....	.....	.....
373	A. Hager No. 2.....	Duval.....	Big Cr. O. & D. Co.....	1020	320	5	.....	.....
374	A. Hager No. 3.....	Duval.....	Big Cr. O. & D. Co.....	990	.....	.....	.....	.....
375	M. A. Lawrence No. 1.....	Duval.....	Big Cr. O. & D. Co.....	1135	.....	.....	.....	.....
376	M. A. Lawrence No. 2.....	Duval.....	Big Cr. O. & D. Co.....	1100	.....	.....	.....	.....
377	Fanny Bell No. 3.....	Duval.....	Big Cr. O. & D. Co.....	1010	.....	.....	.....	.....
378	M. A. Lawrence No. 4.....	Duval.....	Big Cr. O. & D. Co.....	1050	.....	.....	.....	.....

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
990	656	1684	181	1865	142	2370	21	2391	Berea, oil; pay, 12'.....	316
1065	366	1755	185	1940	50	2447	22	2471	Berea, oil; 25 bbls.....	317
1160	605	1886	184	2070	45	2574	22	2602	Berea, oil; 20 bbls.....	318
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	319
919	470	1611	175	1786	80	2279	27	2306	Berea, oil; water, 960.....	320
.....	.....	.....	.....	.....	.....	2374	27½	2401½	Berea, oil.....	321
.....	.....	.....	.....	.....	.....	2472	25	2497	Berea, oil.....	322
.....	.....	.....	.....	.....	.....	2425	24	2449	Berea, oil; 1st day, 50 bbls.....	323
.....	.....	.....	.....	.....	.....	2398	29	2427	Berea, oil.....	324
.....	.....	.....	.....	.....	.....	2380½	21	2401½	Berea, oil.....	325
.....	.....	.....	.....	.....	.....	2536	25	2561	Berea, oil.....	326
.....	.....	.....	.....	.....	.....	2488	24	2512	Berea, oil.....	327
.....	.....	.....	.....	.....	.....	2560	23	2585	Berea, oil.....	328
1200	652	1888	180	.....	.....	2557	25	2585	Berea, oil.....	329
1210	270	1890	195	.....	.....	2595	19	2616	Berea, oil.....	330
1130	630	1860	170	2030	40	2554	21	2596	Berea, oil; 21' pocket.....	331
.....	.....	.....	.....	.....	.....	2544	21	2565	Berea, oil.....	332
.....	.....	.....	.....	.....	.....	2377	24½	2401½	Berea, oil.....	333
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	334
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	335
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	336
.....	.....	1635	185	1820	60	2333	22	2356	Berea, oil.....	337
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	338
1050	450	1750	190	1940	60	2437	25	2464	Berea, oil, 25 bbls.....	339
1140	565	1840	200	2040	40	2524	24	2500	Berea, oil, 30 bbls.; pay, 24'.....	340
1080	613	1800	200	2000	44	2494	22	2519	Berea, oil, 20 bbls.; pay, 22'.....	341
1135	400	1840	195	2035	40	2514	20	2536	Berea, oil, 16 bbls.....	342
1075	605	1775	180	1955	90	2456	22	2478	Berea, oil, 35 bbls.....	343
1000	585	1715	180	1900	80	2401	23	2431	Berea, oil, 25 bbls.....	344
1025	645	1753	192	1945	75	2447	22	2473	Berea, oil, 28 bbls.....	345
800	730	1622	181	1803	42	2305	23	2332	Berea, oil, 35 bbls.....	346
950	600	1654	196	1850	55	2346	22	2369	Berea, oil, 30 bbls.; pay, 16'.....	347
850	470	1535	175	1720	33	2210	24	2238	Berea, oil, 50 bbls.; pay, 24'.....	348
865	495	1564	191	1757	43	2237	25	2264½	Berea, oil, 30 bbls.; pay, 15'.....	349
885	610	1600	170	1770	55	2274	25	2304	Berea, oil, 40 bbls.; pay, 25'.....	350
1190	.....	.....	.....	.....	.....	2512½	22½	2535	Berea, oil.....	351
840	660	1580	190	1770	90	2276½	21	2306½	Berea, oil; gas, 1725.....	352
1205	615	1855	180	2065	80	2620	21	2641	Berea, oil; water, 1320.....	353
970	635	1730	180	1910	50	2417	18	2435	Berea, oil; water, 1070.....	354
810	630	1540	190	1730	90	2230	19	2249	Berea, oil; water, 900.....	355
1090	615	1790	190	1980	60	2468	21	2493	Berea, oil; water, 1170.....	356
1027	676	1750	190	1950	40	2447	21	2471	Berea, oil; water, 1085.....	357
1080	580	1765	185	1950	60	2460	21	2481	Berea, oil; water, 1150.....	358
1025	598	1720	160	1880	90	2348	21	2419	Berea, oil.....	359
1030	650	1780	200	1990	80	2480	21	2501	Berea, oil; gas, 1920.....	360
1801	187	.....	.....	.....	.....	2480	24	2504	Berea, oil; water, 1165.....	361
1150	610	1870	165	2035	65	2560	23	2563	Berea, oil; water, 1270.....	362
850	665	1565	170	1735	75	2246	22	2273	Berea, oil; water, 895.....	363
870	550	1420	220	1640	60	2141	20	2165	Berea, oil.....	364
1143	542	1730	170	1900	45	2402	22	2424	Berea, oil; water, 1143.....	365
1080	660	1780	160	1940	55	2474	25	2499	Berea, oil; gas in B. L.....	366
.....	.....	1710	150	1860	68	2409	23	2432	Berea, oil; water, 1115.....	367
980	610	1628	180	1810	60	2327	21	2348	Berea, oil; water, 1060.....	368
1115	490	1793	172	1965	55	2475	22	2497	Berea, oil; gas, 1945.....	369
1175	655	1870	180	2050	70	2528	25	2553	Berea, oil.....	370
1095	635	1770	155	1925	60	2455	22	2477	Berea, oil.....	371
1150	600	1810	130	1940	60	2490	21	2511	Berea, oil.....	372
1095	605	1765	185	1950	65	2438	21	2459	Berea, oil.....	373
1285	556	1906	152	2058	82	2609	21½	2630½	Berea, oil; water, 1315.....	374
1275	539	1885	165	2050	62	2573	20	2593	Berea, oil; gas, 2038.....	375
1145	610	1800	185	1985	50	2486	22	2508	Berea, oil.....	376
1230	610	1880	180	2060	80	2548	21	2569	Berea, oil; water, 1290.....	377

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
379	M. A. Lawrence No. 3	Duval	Big Cr. O. & D. Co.	1050				
380	Fanny Bell No. 1	Duval	Big Cr. O. & D. Co.	1010	450	5		
381	Fanny Bell No. 2	Duval	Big Cr. O. & D. Co.	1005				
382	Oscar Bell No. 1	Duval	Big Cr. O. & D. Co.	1035				
383	Oscar Bell No. 2	Duval	Big Cr. O. & D. Co.	865				
384	Oscar Bell No. 3	Duval	Big Cr. O. & D. Co.	1035				
385	Oscar Bell No. 4	Duval	Big Cr. O. & D. Co.	1000				
386	Oscar Bell No. 5	Duval	Big Cr. O. & D. Co.	875				
387	Oscar Bell No. 6	Duval	Big Cr. O. & D. Co.	1080				
388	M. A. Lawrence No. 6	Duval	Big Cr. O. & D. Co.	1020				
389	M. A. Lawrence No. 5	Duval	Big Cr. O. & D. Co.	1050			520	
390	H. B. Griffith No. 1	Duval	Big Cr. O. & D. Co.	665				
391	John Stowers No. 1	Duval	Big Cr. O. & D. Co.	670				
392	D. A. Oxley No. 1	Duval	Big Cr. O. & D. Co.	1010	370	4		
393	A. G. Lawrence No. 1	Duval	Ohio Fuel O. Co.	1080L				
394	Albert Lawrence No. 2	Duval	Ohio Fuel O. Co.	1120				
395	Albert Lawrence No. 3	Duval	Ohio Fuel O. Co.	1020				
396	Albert Lawrence No. 4	Duval	Ohio Fuel O. Co.	1075				
397	Albert Lawrence No. 5	Duval	Ohio Fuel O. Co.	910				
398	Albert Lawrence No. 6	Duval	Ohio Fuel O. Co.	860				
399	Albert Lawrence No. 1	Duval	Ohio Fuel O. Co.	770				
400	Albert Lawrence No. 1	Duval	Holly O. & D. Co.	985				
401	Albert Lawrence No. 2	Duval	Holly O. & D. Co.	880				
402	Albert Lawrence No. 3	Duval	Holly O. & D. Co.	820				
403	Albert Lawrence No. 4	Duval	Holly O. & D. Co.	795				
404	Albert Lawrence No. 5	Duval	Holly O. & D. Co.	990				
405	G. T. Lawrence No. 6	Duval	Holly O. & D. Co.	775				
406	G. T. Lawrence No. 5	Duval	Holly O. & D. Co.	745				
407	G. T. Lawrence No. 4	Duval	Holly O. & D. Co.	940				
408	G. T. Lawrence No. 3	Duval	Holly O. & D. Co.	885				
409	G. T. Lawrence No. 2	Duval	Holly O. & D. Co.	1015				
410	G. T. Lawrence No. 1	Duval	Holly O. & D. Co.	990				
411	Chas. Keeny No. 1	Duval	Columbia G. & E. Co.	950				
412	G. N. Griffith No. 1	Duval	South Penn O. Co.	782L				
413	Jas. Hall No. 1	Duval	South Penn O. Co.	885				
414	Jas. Hall No. -	Duval	South Penn O. Co.	1050				
415	B. P. McKinney	Duval	Holly O. & Dev. Co.	720				
416	N. J. Turley No. 1	Duval	United Fuel Co.	805L				
417	Horse Cr. C. Land Co.	Duval	United Fuel Co.	695				
418	Horse Cr. C. Land Co.	Duval	Benedum & Trees	925				
419	George Sheets	Duval	South Penn O. Co.	770				
420	W. Griffith No. 1	Duval	South Penn O. Co.	800				
421	Alonzo Stowers No. 50	Duval	Columbia G. & E. Co.	886LC	300	3		
422	C. W. & E. Z. May No. 7	Duval	Guyan O. Co.	930				
423	Poor Farm	Carroll	Holly O. & D. Co.	670				
424	D. J. Beckett	Carroll	Buffalo O. & G. Co.	630				
425	Job Holley	Carroll		665				
426	Geo. Black	Carroll	Jennings O. Co.	900				
427	A. F. Black	Carroll	Jennings O. Co.	750				
428	J. W. Nida	Carroll	South Penn O. Co.	730				
429	Williams	Washington	South Penn O. Co.	650				
430	Wm. Trimble	Washington		755				
431	Mohlar Tract	Washington		660				
432	W. H. Johnson	Sheridan		668L				
433	Walters	Sheridan	Cont. O. & G. Co.	690				
434	E. E. Sowards No. 1	Sheridan	Big Cr. Dev. Co.	1105				
435	Ed. Sanson No. 19	Sheridan	Hamlin O. Co.	1000LC				
436	Ed. Sanson No. 21	Sheridan	Hamlin O. Co.	995				
437	Ed. Sanson No. 18	Sheridan	Hamlin O. Co.	930				
438	Ed. Sanson No. 11	Sheridan	Hamlin O. Co.	813LC			300	
439	Ed. Sanson No. 20	Sheridan	Hamlin O. Co.	995				
440	Ed. Sanson No. 17	Sheridan	Hamlin O. Co.	888				
441	Ed. Sanson No. 15	Sheridan	Hamlin O. Co.	820				

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
1230	585	1885	173	2058	72	2552	22	2574	Berea, oil; water, 1295.	379
1260	570	1815	185	2000	40	2506	22	2528	Berea, oil.	380
1170	610	1830	170	2000	50	2511	19	2530	Berea, oil.	381
1220	583	1836	204	2070	75	2533	22	2555	Berea, oil; gas, 1984.	382
1035	565	1680	180	1860	45	2368	18	2390	Berea, oil.	383
1190	630	1836	187	2059	50	2540	21	2562	Berea, oil.	384
1150	560	1798	180	1978	62	2478	24	2502	Berea, oil.	385
1020	580	1675	165	1840	60	2354	21	2375	Berea, oil.	386
1230	560	1875	170	2040	80	2545	21	2565	Berea, oil.	387
1175	655	1830	170	2000	60	2505	22	2527	Berea, oil.	388
1290	610	1965	150	2115	50	2640	23	2663	Berea, oil.	389
810	600	1410	225	1645	50	2128	19	2152	Berea, oil.	390
840	522	1410	220	1650	20	2137	18	2170	Berea, oil.	391
1175	575	1800	190	1990	50	2464	23	2487	Berea, oil.	392
1230	625	1885	185	2070	52	2570	20½	2590½	Berea, oil; water, 1360.	393
1290	602	1932	181	2113	62	2606	20	2626	Berea, oil.	394
1142	658	1832	165	.....	.....	2510	22	2534	Berea, oil.	395
1280	410	1855	186	2071	60	2555	20	2575	Berea, oil.	396
1110	552	1702	180	.....	.....	2382	20	2404	Berea, oil.	397
1072	608	1665	165	1830	50	2339	23	2363½	Berea, oil.	398
960	564	1565	170	1735	60	2240	20	2260	Berea, oil.	399
1190	507	1778	174	1952	50	2470	20	2497	Berea, oil.	400
1140	567	1794	170	1964	56	2467	20	2489	Berea, oil.	401
973	573	1624	184	1808	48	2299	21	2325	Berea, oil.	402
940	610	1592	174	1766	40	2272	22	2294	Berea, oil.	403
1023	585	1658	177	1835	60	2348	21	2369	Berea, oil.	404
932	540	1535	176	1731	53	2244	18	2262	Berea, oil.	405
883	574	1529	173	1702	68	2119	21	2240	Berea, oil.	406
1146	509	1740	168	1908	68	2424	23	2450	Berea, oil.	407
1080	490	1710	170	1880	55	2377	22	2403	Berea, oil.	408
1220	507	1814	154	1968	65	2497	23	2524	Berea, oil.	409
1187	510	1793	150	1933	82	2468	23	2494	Berea, oil.	410
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	411
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	412
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	413
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	414
855	615	1500	190	.....	.....	2196	20	2218	Berea, Dry; little gas in B. L.	415
675	625	1485	200	.....	.....	2171½	19½	2191	Berea, gas.	416
735	465	1305	200	1505	35	2019	17	2036	Berea, gas.	417
.....	.....	1650	200	1850	45	2356	21	2379	Berea, oil; gas, 231,000'	418
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	419
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	420
.....	.....	1585	165	1750	175	2299	23	2322	Berea, gas, 2 mil.; pay 18'	421
.....	.....	.....	.....	.....	.....	2403	23	2431	Berea, oil.	422
.....	.....	1255	208	1527	64	1973	20	1993	Berea, gas.	423
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	424
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	425
905	505	1475	190	1699	42	2196	24	2221	Berea gas well.	426
650	425	1265	205	1480	22	.....	.....	1502	Big Injun gasser.	427
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	428
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	429
.....	.....	1560	200	1760	60	2263	20	2288	Berea, 2 bbls. oil natural.	430
.....	.....	1275	205	1480	15	1940	13	2739	Berea, gas.	431
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	432
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	433
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	434
1045	150	1574	122	.....	.....	.....	.....	1696	Big Injun; oil 20 bbls.; pay, 1662-67.	435
910	90	1508	100	.....	.....	.....	.....	1608	Big Lime; oil.	436
850	210	1398	144	.....	.....	.....	.....	1542	B. L.; oil, 15 bbls.; pay, 8'.	437
725	413	1290	154	.....	.....	.....	.....	1444	B. L.; oil, 12 bbls.; pay, 5'.	438
950	365	1488	109	.....	.....	.....	.....	1597	B. L.; oil, 2 bbls.; pay, 4'.	439
795	410	1370	220	1610	20	.....	.....	1638	B. Injun; gas, 2 mil.; pay 15'	440
710	205	1270	208	1506	29	.....	.....	1535	B. Injun; gas, 2½ mil.; pay, 18'	441

Summarized Record of Wells in

No. on Map	Name of Well	District.	Owner	Eleva- tion	No 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
442	Ira Burger.....	Sheridan...	Hamlin O. Co.....	955	.....	.....	.....	.....
443	C. L. McComas No. 90.....	Sheridan...	Columbia G. & E. Co.....	714Lc	.....	.....	.....	.....
444	Swisher & Elkins.....	Sheridan...	Octo Oil Co.....	705	.....	.....	.....	.....
445	C. L. McComas No. 114.....	Sheridan...	Columbia G. & E. Co.....	792Lc	.....	.....	.....	.....
446	W. G. Hatfield No. 56.....	Sheridan...	Columbia G. & E. Co.....	623Lc	.....	.....	.....	.....
447	W. G. Hatfield No. 72.....	Sheridan...	Columbia G. & E. Co.....	1054Lc	.....	.....	73	.....
448	P. & C. Boothe No. 66.....	Sheridan...	Columbia G. & E. Co.....	658Lc	.....	.....	50	.....
449	P. & C. Boothe No. 103.....	Sheridan...	Columbia G. & E. Co.....	744Lc	.....	.....	.....	.....
450	Mrs. E. S. Holderby No. 1.....	Sheridan...	Jennings O. Co.....	690	.....	.....	.....	.....
451	Mrs. E. S. Holderby No. 2.....	Sheridan...	Jennings O. Co.....	750	.....	.....	.....	.....
452	Lincoln Land Assn. No. 82.....	Sheridan...	Columbia G. & E. Co.....	802Lc	.....	.....	.....	.....
453	Lincoln Land Assn. No. 115.....	Sheridan...	Columbia G. & E. Co.....	790	.....	.....	170	.....
454	C. & R. Boothc No. 48.....	Sheridan...	Columbia G. & E. Co.....	661Lc	.....	.....	.....	.....
455	Deck Wilson No. 1.....	Sheridan...	Hamlin O. Co.....	665Lc	25	3	.....	.....
456	E. & A. Hodge.....	Sheridan...	Hamlin O. Co.....	705Lc	.....	.....	.....	.....
457	Ella Adkins.....	Sheridan...	South Penn O. Co.....	720	.....	.....	150	.....
458	O. F. Franklin.....	Sheridan...	South Penn O. Co.....	890	.....	.....	.....	.....
459	W. T. Keck No. 44.....	Sheridan...	Columbia G. & E. Co.....	862Lc	.....	.....	.....	.....
460	J. L. Caldwell No. 118.....	Sheridan...	Columbia G. & E. Co.....	946	.....	.....	.....	.....
461	E. & A. Hodge.....	Sheridan...	Hamlin O. Co.....	920	.....	.....	.....	.....
462	E. & A. Hodge.....	Sheridan...	Wilson & Clemings.....	910	.....	.....	.....	.....
463	Frank Roe.....	Sheridan...	Cont. O. & G. Co.....	800	.....	.....	.....	.....
464	C. A. Scites.....	Sheridan...	Hamlin O. Co.....	590	.....	.....	.....	.....
465	C. A. Scites No. 194.....	Sheridan...	United Fuel Co.....	630	.....	.....	.....	.....
466	C. A. Scites No. 35.....	Sheridan...	Columbia G. & E. Co.....	595L	.....	.....	.....	.....
467	W. Scites No. 268.....	Sheridan...	United Fuel G. Co.....	1040	.....	.....	.....	.....
468	Talbott McComas.....	Sheridan...	South Penn O. Co.....	610	.....	.....	.....	.....
469	J. R. Branch.....	Sheridan...	United Fuel G. Co.....	585	.....	.....	.....	.....
470	J. R. Branch No. 185.....	Sheridan...	United Fuel G. Co.....	655	.....	.....	.....	.....
471	Cook & Evans No. 188.....	Sheridan...	United Fuel G. Co.....	650	.....	.....	.....	.....
472	Cook & Evans No. 189.....	Sheridan...	United Fuel G. Co.....	625	.....	.....	.....	.....
473	Cook & Evans No. 196.....	Sheridan...	United Fuel G. Co.....	965	.....	.....	.....	.....
474	J. R. Branch No. 193.....	Sheridan...	United Fuel G. Co.....	960	.....	.....	.....	.....
475	J. R. Branch No. 192.....	Sheridan...	United Fuel G. Co.....	765	.....	.....	.....	.....
476	J. R. Branch No. 191.....	Sheridan...	United Fuel G. Co.....	705	.....	.....	.....	.....
477	J. R. Branch No. —.....	Sheridan...	United Fuel G. Co.....	615	.....	.....	.....	.....
478	J. K. Branch No. 197.....	Sheridan...	United Fuel G. Co.....	690	.....	.....	.....	.....
479	J. L. Caldwell.....	Sheridan...	Cont. O. & G. Co.....	.....	.....	.....	.....	.....
480	Almeda Dials No. 186.....	Sheridan...	United Fuel G. Co.....	620	.....	.....	.....	.....
481	Almeda Dials No. 184.....	Sheridan...	United Fuel G. Co.....	600L	.....	.....	.....	.....
482	—No. 75.....	Sheridan...	Columbia G. & E. Co.....	776Lc	.....	.....	.....	.....
483	Albert Harless No. 46.....	Sheridan...	Columbia G. & E. Co.....	645Lc	.....	.....	.....	.....
484	Guyandot L. Assn. No. 83.....	Sheridan...	Columbia G. & E. Co.....	728Lc	.....	.....	.....	.....
485	E. E. Adkins No. 104.....	Sheridan...	Columbia G. & E. Co.....	900Lc	.....	.....	.....	.....
486	—No. 113.....	Sheridan...	Columbia G. & E. Co.....	995	.....	.....	.....	.....
487	Guyandot L. A. No. 54.....	Sheridan...	Columbia G. & E. Co.....	608Lc	.....	.....	27	.....
488	A. M. Dial & Burgess No. 183	Sheridan...	United Fuel G. Co.....	576L	.....	.....	.....	.....
489	Guyandot L. A. No. 57.....	Sheridan...	Columbia G. & E. Co.....	609Lc	.....	.....	.....	.....
490	Guyandot L. A. No. 105.....	Sheridan...	Columbia G. & E. Co.....	708Lc	.....	.....	133	.....
491	Guyandot L. A. No. 85.....	Sheridan...	Columbia G. & E. Co.....	974Lc	.....	.....	.....	.....
492	Guyandot L. A. No. 93.....	Sheridan...	Columbia G. & E. Co.....	627Lc	.....	.....	.....	.....
493	Guyandot L. A. No. 53.....	Sheridan...	Columbia G. & E. Co.....	578Lc	.....	.....	.....	.....
494	Mrs. Chas. B. Roy No. 187.....	Sheridan...	United Fuel G. Co.....	650	.....	.....	66	.....
495	Harry Hays No. 182.....	Sheridan...	United Fuel G. Co.....	610	.....	.....	.....	.....
496	Guyandot L. A. No. 69.....	Sheridan...	Columbia G. & E. Co.....	1105L	.....	.....	535	.....
497	Guyandot L. A. No. 76.....	Sheridan...	Columbia G. & E. Co.....	958Lc	.....	.....	.....	.....
498	Thos. Brunty.....	Sheridan...	Guyan O. Co.....	984Lc	.....	.....	.....	.....
499	Guyandot L. A. No. 49.....	Sheridan...	Columbia G. & E. Co.....	966Lc	.....	.....	.....	.....
500	Guyandot L. A. No. 15.....	Sheridan...	Guyan O. Co.....	996Lc	.....	.....	.....	.....
501	Guyandot L. A. No. 39.....	Sheridan...	Columbia G. & E. Co.....	988Lc	.....	.....	.....	.....
502	Guyandot L. A. No. 11.....	Sheridan...	Guyan O. Co.....	946Lc	.....	.....	.....	.....
503	Guyandot L. A. No. 10.....	Sheridan...	Guyan O. Co.....	881Lc	.....	.....	.....	.....
504	Guyandot L. A. No. 13.....	Sheridan...	Guyan O. Co.....	895Lc	.....	.....	315	.....

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
600	395	1175	215	1400	28			1428	B. Injun; gas, 3½ mil.; pay, 2'	442
670	470	1250	225	1490	42			1532	B. Injun; gas, 1 mil.; pay, 22'	444
555	360	1086	217	1331	16			1347	Big Injun; gas.	446
980	220	1540	235	1775	20			1797	Big Injun; gas, 5 mil.; pay, 15'	447
800	165	1113	195	1348	16			1364	Big Injun; gas, 4 mil.; pay, 11'	448
600	240	1162	229	1421	34			1455	Big Injun; gas, ¾ mil.; pay, 25'	449
550	556	1106	222	1358	32			1390	Big Injun; gas.	450
		1155	132	1400	21			1421	Big Lime; oil; gas in Big I.	451
615	200	1215	225	1459	17			1476	B. Injun; gas, 2 mil.; pay, 15'	452
620	420	1215	220	1455	22			1477	B. Injun; gas, 2½ mil.; pay, 16'	453
550	385	1099	241	1362	12			1374	B. Injun; gas, 3 mil.	454
570	260	1145		1174	213			1387	B. Injun; gas, 3½ mil.; 2 pays, 8' 12'	455
601	419	1152	228	1401	15			1416	B. Injun; gas, 4 mil.; pay, 12'	456
700	380	1270	167	1485	15			1500	B. Injun; gas.	457
840	365	1430	170	1644	12			1656	B. Injun; gas.	458
800	170	1344	201	1577	13			1598	B. Injun; gas, 5 mil.; pay, 13'	459
815	425	1388	227	1627	25			1651	B. Injun; gas, 5 mil.; pay, 12'	460
								1651	Big Injun.	461
										462
										463
530	360	1084		1328	26			1354	Big Injun; gas, ½ mil.	464
		1109	240	1366	11½			1377½	Dry hole.	465
545	355	1040	220	1316	29			1349	Big Injun; gas, 6 mil.; pay, 20'	466
		1578	215	1765	40			1806	Dry hole.	467
565	390	1130	167	1364	15			1379	Dry hole.	468
										469
		1065	220	1304	24			1328	B. Injun; gas, 3½ mil.	470
		1075	233	1320	50			1373	B. Injun; gas, ¾ mil.	471
		1025	220	1270	47			1318	B. Injun; gas, 2 mil.	472
		1394	216	1642	40			1682	B. Injun; gas, ¾ mil.	473
		1408	212	1449	42			1691	B. Injun; gas, 1¼ mil.	474
		1165	224	1414	39			1457	B. Injun; gas, 1½ mil.	475
		1115	217	1349	31			1380	B. Injun; gas, 1¾ mil.	476
										477
		1075	225	1327	32			1360	B. Injun; gas, 2½ mil.	478
										479
550	225	1108	229	1350	38			1390	B. Injun; gas, 3 mil.	480
550	380	1047	224	1320	17			1337	B. Injun; gas, 2 mil.	481
766	394	1276	210	1518	27			1545	B. Injun; gas, 4 mil.; pay, 11'	482
580	465	1158	212	1390	25			1420	B. Injun; gas, 4½ mil.; pay, 12'	483
785	295	1220	240					1504	B. Injun; gas, 1½ mil.; pay, 10'	484
920	370	1400	231	1657	15			1672	B. Injun; gas, 3 mil.; pay, 10'	485
1048	177	1510	215	1755	13			1768	B. Injun; gas, 3 mil.; pay, 13'	486
590	355	1085	235	13						

Summarized Record of Wells in

No. on Map	Name of Well	District	Owner	Elevation	No 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
505	Guyandot L. A. No. 74.....	Sheridan...	Columbia G. & E. Co.....	695LC
506	G. M. Adkins No. 6.....	Sheridan...	Fourmile O. Co.....	823LC
507	Guyandot L. A. No. 110.....	Sheridan...	Columbia G. & E. Co.....	799LC
508	Guyandot L. A. No. 6.....	Sheridan...	Guyan O. Co.....	685LC
509	Guyandot L. A. No. 5.....	Sheridan...	Guyan O. Co.....	671LC	70	2
510	Guyandot L. A. No. 28.....	Sheridan...	Columbia G. & E. Co.....	653LC	78	4
511	Guyandot L. A. No. 30.....	Sheridan...	Columbia G. & E. Co.....	604LC
512	Guyandot L. A. No. 64.....	Sheridan...	Columbia G. & E. Co.....	1110	520	4
513	Guyandot L. A. No. 47.....	Sheridan...	Columbia G. & E. Co.....	1032LC	450	5
514	Guyandot L. A. No. 51.....	Sheridan...	Columbia G. & E. Co.....	740LC	125	2
515	Guyandot L. A. No. 23.....	Sheridan...	Columbia G. & E. Co.....	633LC
516	Guyandot L. A. No. 29.....	Sheridan...	Columbia G. & E. Co.....	646LC
517	Guyandot L. A. No. 14.....	Sheridan...	Guyan O. Co.....	692LC
518	Guyandot L. A. No. 2.....	Sheridan...	Fourmile O. Co.....	796LC
519	Guyandot L. A. No. 1.....	Sheridan...	Fourmile O. Co.....	683LC	102	3
520	Guyandot L. A. No. —.....	Sheridan...	Guyan O. Co.....	685
521	Mary E. Mason No. 2.....	Union.....	Ohio Fuel O. Co.....	1080
522	Mary E. Mason No. 3.....	Union.....	Ohio Fuel O. Co.....	1105
523	L. E. & E. B. Holstein No. 1.	Union.....	Big Cr. Dev. Co.....	955
524	L. E. & E. B. Holstein No. 2.	Union.....	Big Cr. Dev. Co.....	955
525	L. E. & E. B. Holstein No. 6.	Union.....	Big Cr. Dev. Co.....	940
526	L. E. & E. B. Holstein No. 4.	Union.....	Big Cr. Dev. Co.....	745
527	L. E. & E. B. Holstein No. 1.	Union.....	Big Cr. Dev. Co.....	730
528	L. E. & E. B. Holstein No. 5.	Union.....	Big Cr. Dev. Co.....	720
529	L. E. Holstein No. 22.....	Union.....	Guyan O. Co.....	741LC
530	L. E. Holstein No. 23.....	Union.....	Guyan O. Co.....	912
531	Gordon Mason No. 16.....	Union.....	Guyan O. Co.....	1058LC
532	Peter Woodrum No. 1.....	Union.....	Big Cr. Dev. Co.....	1115
533	Benj. Burton No. 10.....	Union.....	Duval O. Co.....	1120
534	Benj. Burton No. 11.....	Union.....	Duval O. Co.....	1070
535	Benj. Burton No. 3.....	Union.....	Duval O. Co.....	1125
536	Benj. Burton No. 5.....	Union.....	Duval O. Co.....	1065
537	Benj. Burton No. 14.....	Union.....	Duval O. Co.....	895
538	Benj. Burton No. 13.....	Union.....	Duval O. Co.....	820
539	Benj. Burton No. 4.....	Union.....	Duval O. Co.....	900
540	J. M. Egnor No. 26.....	Union.....	Guyan Oil Co.....	896LC
541	J. M. Egnor No. 25.....	Union.....	Guyan Oil Co.....	1058LC
542	Benj. Burton No. 20.....	Union.....	Guyan Oil Co.....	1153LC
543	Benj. Burton No. 46.....	Union.....	Guyan Oil Co.....	1063LC
544	L. E. Holstein No. 47.....	Union.....	Guyan Oil Co.....	942LC
545	L. E. Holstein No. 28.....	Union.....	Guyan Oil Co.....	996LC
546	N. Brewer No. 27.....	Union.....	Guyan Oil Co.....	1055LC	523	4
547	J. M. Egnor No. 2.....	Union.....	South Penn O. Co.....	686LC
548	J. M. Egnor No. 1.....	Union.....	South Penn O. Co.....	690
549	Nanny Brewer No. —.....	Union.....	Big Cr. Dev. Co.....	695	150	1
550	Peter Woodrum No. 2.....	Union.....	Big Cr. Dev. Co.....	960
551	J. M. Egnor No. 29.....	Union.....	Columbia G. & E. Co.....	935LC	400	5
552	Mary E. Mason No. 1.....	Union.....	Ohio Fuel O. Co.....	790
553	Nanny Brewer No. 3.....	Union.....	Big Cr. Dev. Co.....	770
554	Mary E. Mason No. 5.....	Union.....	Ohio Fuel O. Co.....	685
555	Horse Creek No. 7.....	Union.....	South Penn O. Co.....	1170
556	John King.....	Union.....	—.....	695
557	Mary E. Mason No. 4.....	Union.....	Ohio Fuel O. Co.....	990
558	Mary E. Mason No. 6.....	Union.....	Ohio Fuel O. Co.....	860
559	Mary E. Mason No. 7.....	Union.....	Ohio Fuel O. Co.....	890	375	5
560	Baldy Woodrum No. 1.....	Union.....	Ohio Fuel O. Co.....	865
561	Julia Woodrum No. 3.....	Union.....	Big Cr. Dev. Co.....	920
562	Julia Woodrum No. 1.....	Union.....	Big Cr. Dev. Co.....	1090
563	Julia Woodrum No. 4.....	Union.....	Big Cr. Dev. Co.....	1105	470	2
564	Julia Woodrum No. 2.....	Union.....	Big Cr. Dev. Co.....	990
565	Mary Keeny No. 1.....	Union.....	Ohio Fuel O. Co.....	885
566	Mary Keeny No. 2.....	Union.....	Ohio Fuel O. Co.....	725
567	Lincoln L. A. No. 5.....	Jefferson...	South Penn.....	820LC

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness	Depth (top)	Thickness			
648	302	1128	123	1377	42	.....	.....	1420	B. Injun; gas, 1 mil.; oil B. L.	505
840	310	1290	220	1558	35	.....	.....	1593	B. Injun; gas, 1 mil.; pay, 17'	506
800	320	1285	210	1521	24	.....	.....	1545	B. Injun; gas, 1 mil.; pay, 18'	507
635	315	1103	133	1215	11	.....	.....	1236	B. Lime; oil, 75 bbls.; pay, 11'	508
606	324	1085	143	.....	.....	.....	.....	1228	B. Injun; oil, 18 bbls.	509
570	320	1058	227	1313	21	.....	.....	1334	B. Injun; gas, 2 mil.; 1 bbl. oil, B. L.	510
.....	.....	1016	216	1259	11	.....	.....	1282	B. Injun; gas.	511
950	394	1525	230	1773	29	.....	.....	1802	B. Injun; gas, B. L., oil and gas.	512
950	330	1447	216	1703	37	.....	.....	1740	B. Injun; gas, 3 mil.; pay, 25'	513
595	393	1130	228	1382	30	.....	.....	1412	B. Injun; gas, 3 mil.; pay, 8'	514
565	103	1045	223	1300	.....	1864	26	1890	B. Injun; gas, 1½ mil.; pay, 11'; oil & gas in B. L.	515
588	305	1081	214	1330	45	.....	.....	1375	B. L.; gas, ¾ mil., and oil; oil in B. L.	516
690	355	1169	245	1435	13	1985	6	2002	B. L.; oil, 12 bbls.; pay, 4'; 5' coal in Salt sand	517
820	313	1275	143	.....	.....	.....	.....	1435	B. L.; oil, 10 bbls.; pay, 8'; gas.	518
704	336	1158	160	.....	.....	.....	.....	1318	B. L.; oil, 50 bbls.; pay, 5'	519
770	340	1228	235	1503	25	2050	5	2068	Dry hole.	520
.....	.....	.....	.....	.....	.....	.....	.....	2574	Berea	521
.....	.....	1879	211	2090	60	2577	23	2600	Berea; oil.	522
1100	620	1760	195	1955	75	2440	22	2464	Berea; oil; some gas, 1895.	523
1050	675	1762	188	1950	65	2458	21	2488	Berea; oil; some gas, 1890.	524
1050	600	1734	190	1924	66	2433	25	2458	Berea; oil.	525
855	650	1547	195	1742	60	2235	22	2265	Berea; oil; water, 910.	526
825	673	1546	179	1725	50	2214	21	2247	Berea; oil; gas, 1616, 1686, 2214.	527
826	609	1522	185	1707	60	2206	24	2230	Berea; oil; gas, 1650.	528
830	490	1520	190	1710	40	2209	22	2232	Berea; oil; gas, 20 bbls.	529
1005	610	1695	189	1884	50	2382	22	2404	Berea; oil; 11 bbls.	530
1160	600	1848	180	2028	72	2529	21	2551	Berea; oil; 15 bbls.	531
1040	660	1790	180	1970	50	2454	23	2477	Berea; oil; water, 1070.	532
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	533
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	534
1190	690	1920	165	2083	70	2600	24	2624	Berea; oil.	535
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	536
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	537
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	538
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	539
965	805	1670	200	1870	65	2356	25	2385	Berea; oil, 25 bbls.	540
1125	640	1841	189	2030	30	2532	23	2547	Berea; oil, 50 bbls.	541
1225	535	1935	175	2115	80	2621	23	2644½	Berea; oil, 15 bbls.	542
1137	623	1864	188	2052	30	2531	23	2555	Berea; oil, 30 bbls.	543
1025	615	1725	195	1920	40	2411	25	2438	Berea; oil, 20 bbls.	544
1070	630	1790	190	1980	58	2465	23	2487	Berea; oil, 30 bbls.	545
1135	525	1845	185	2030	35	2530	10	2540	Berea; oil, 30 bbls.	546
775	500	1460	95	1655	80	2135	21	2156	.....	547
750	500	1440	232	1672	60	2137	24	2161	.....	548
980	655	1679	195	1874	65	2362	23	2385	Berea; oil; water, 1040.	549
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	550
1020	480	1686	184	1870	55	2483	26	2510	Berea; gas, ½ mil.	551
.....	.....	.....	.....	.....	.....	.....	.....	2316	Berea; oil.	552
890	600	1595	170	1765	40	2265	26	2291	Berea; oil; water, 960.	553
800	590	1467	180	.....	.....	2146	20	2171	Berea; oil.	554
1145	680	1930	197	2150	40	2622	22	2644	.....	555
850	560	1460	180	1640	50	2142	22	2167	Berea; oil.	556
1080	655	1768	187	1955	60	2450	25	2475	Berea; oil.	557
770	585	1465	185	1650	45	2151	23	2174	Berea; oil.	558
960	625	1668	187	1855	50	2348	21	2371	Berea; oil.	559
980	585	1613	205	1815	60	2303	27	2330	Berea; oil.	560
1000	620	1710	180	1890	50	2391	23	2416	Berea; oil; water, 1095.	561
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	562
985	610	1700	180	1890	75	2380	21	2401	Berea; oil; water, 1100.	563
1100	630	1825	185	2020	40	2497	23	2520	Berea; oil; water, 1190.	564
700	650	1474	191	1740	15	2172	24	2196	Berea; oil; 300,000' gas, 1565.	565
.....	.....	.....	.....	.....	.....	2429½	20½	2450	Berea; oil.	566
.....	.....	1535	75	.....	.....	2222	28	2669	Dry	567

Summarized Record of Wells in

No. on Map.	Name of Well	District	Owner	Eleva- tion	NO. 5 BLOCK COAL		STOCKTON- LEWISTON COAL	
					Depth (top)	Thick- ness	Depth (top)	Thick- ness
568	Jas. Linkous.....	Jefferson....	Big Cr. Dev. Co.....	855	.....	.....	.....	.....
569	D. G. Courtney.....	Jefferson....	D. G. Courtney et al.....	810	.....	.....	.....	.....
570	Poster Sperry.....	Jefferson....	Guyan O. Co.....	746LC	.....	.....	.....	.....
571	Lincoln L. Assn.....	Jefferson....	South Penn O. Co.....	700L	.....	.....	.....	.....
572	J. Lambert.....	Harts Creek.	South Penn O. Co.....	725	.....	145	2	.....
573	Lincoln L. A. No. 6.....	Harts Creek.	South Penn O. Co.....	700L	.....	.....	.....	.....
574	A. Allen.....	Harts Creek.	A. Allen.....	655	.....	.....	.....	.....
575	Lincoln L. A. No. 4.....	Harts Creek.	South Penn O. Co.....	670L	.....	.....	.....	.....
576	J. C. Miller No. 1.....	Laurel Hill..	J. C. Miller.....	660	.....	.....	.....	.....
577	Guyandot L. A. No. 4.....	Laurel Hill..	Hamlin O. Co.....	618LC	.....	.....	.....	.....
578	Guyandot L. A. No. 45.....	Laurel Hill..	Columbia G. & E. Co.....	632LC	.....	20	3	.....
579	Guyandot L. A. No. 36.....	Laurel Hill..	Columbia G. & E. Co.....	630LC	.....	.....	.....	.....
580	Guyandot L. A. No. 13.....	Laurel Hill..	Hamlin O. Co.....	713LC	.....	75	3	.....
581	Guyandot L. A. No. 100.....	Laurel Hill..	Columbia G. & E. Co.....	795LC	.....	.....	.....	.....
582	Alice Clark No. 121.....	Sheridan....	Columbia G. & E. Co.....	655	.....	25	3	.....
583	Alice Clark No. 11.....	Sheridan....	Hamlin O. Co.....	680LC	.....	.....	.....	.....
584	Alice Clark No. 12.....	Sheridan....	Hamlin O. Co.....	709LC	.....	50	5	.....
585	Alice Clark No. 112.....	Sheridan....	Columbia G. & E. Co.....	764LC	.....	80	3	.....
586	Alice Clark No. 58.....	Sheridan....	Columbia G. & E. Co.....	729LC	.....	.....	.....	.....
587	Alice Clark No. 32.....	Sheridan....	Guyan O. Co.....	1127	.....	.....	.....	.....
588	E. Spurlock No. 137.....	Sheridan....	Conservative O. & G. Co.....	645	.....	.....	.....	.....
589	Guyandot Land Assn.....	Sheridan....	Sheridan....	714LC	.....	.....	.....	.....
590	Guyandot Land Assn. No. 16.....	Sheridan....	Guyan O. Co.....	714LC	.....	.....	.....	.....
591	Guyandot Land Assn. No. 3.....	Sheridan....	Fourmile O. Co.....	904LC	.....	.....	.....	.....
592	Guyandot Land Assn. No. 5.....	Sheridan....	Fourmile O. Co.....	954LC	.....	.....	.....	.....
593	Guyandot Land Assn. No. 4.....	Sheridan....	Fourmile O. Co.....	950	.....	.....	.....	.....
594	W. W. Baker No. 1.....	Carroll.....	Carroll.....	665	.....	.....	.....	.....
595	Guyandot L. A. No. 42.....	Laurel Hill..	Columbia G. & E. Co.....	740LC	.....	.....	.....	.....
596	Jesse Hoover.....	Union.....	Smith O. Co.....	810	.....	.....	.....	.....
597	W. Plumbley.....	Union.....	Guyan O. Co.....	785LC	.....	.....	.....	.....
598	Jas. Dingess.....	Jefferson....	Columbia G. & E. Co.....	820	.....	.....	.....	.....
599	Marine Lovejoy.....	Jefferson....	Columbia G. & E. Co.....	710L	.....	.....	.....	.....
600	Lincoln L. A. No. 2.....	Jefferson....	South Penn O. Co.....	738L	25	2	.....	.....
601	E. W. Stowers No. 88.....	Duval.....	Columbia G. & E. Co.....	755LC	150	5	.....	.....
602	Lucy Stowers No. 87.....	Duval.....	Columbia G. & E. Co.....	697L	.....	.....	.....	.....
603	Alonzo Stowers.....	Duval.....	Columbia G. & E. Co. No. 63	673LC	.....	125	5	.....
604	Seaboard Fuel Co.....	Washington.	Amer. O. & Dev. Co.....	775L	.....	.....	.....	.....
605	Seaboard Fuel Co. No. 4.....	Washington.	Amer. O. & Dev. Co.....	645	.....	.....	.....	.....
606	Seaboard Fuel Co. No. 2.....	Washington.	Amer. O. & Dev. Co.....	815	.....	187	3	.....
607	Seaboard Fuel Co. No. 1.....	Washington.	Amer. O. & Dev. Co.....	855	.....	242	3	.....
608	Lincoln L. A. No. 3.....	Jefferson....	South Penn O. Co.....	840L	.....	55	5	.....
609	E. E. Sowards.....	Sheridan....	Bowden Keklin Co.....	935	.....	.....	.....	.....
610	Ira Smith.....	Laurel Hill..	.....	579LC	.....	.....	.....	.....
611	A. T. Dotson.....	Jefferson....	Columbia G. & E. Co.....	830L	.....	.....	.....	.....
612	Tobias Holly.....	Carroll.....	Carroll.....	660	.....	.....	.....	.....
613	Guyandot L. A.....	Sheridan....	Hamlin O. Co.....	700	.....	.....	.....	.....
614	Guyandot L. A.....	Laurel Hill..	Columbia G. & E. Co.....	690	.....	.....	.....	.....
615	Guyandot L. A. No. 79.....	Sheridan....	Columbia G. & E. Co.....	655	.....	.....	.....	.....
616	A. Adkins No. 16.....	Sheridan....	Hamlin O. Co.....	630	.....	.....	.....	.....
617	Guyandot L. A. No. 194.....	Sheridan....	Hamlin O. Co.....	634LC	.....	.....	.....	.....
618	Guyandot L. A. No. 102.....	Harts Creek.	Columbia G. & E. Co.....	643LC	.....	.....	.....	.....
619	T. J. McMillan No. 95.....	Duval.....	Columbia G. & E. Co.....	968	.....	.....	.....	.....
620	Lincoln L. A.....	Sheridan....	Columbia G. & E. Co. No. 96	604LC	.....	.....	.....	.....
621	W. T. Black No. 119.....	Sheridan....	Columbia G. & E. Co.....	953	.....	.....	.....	.....
622	Lincoln L. A. No. 138.....	Sheridan....	Hamlin O. Co.....	.....	.....	.....	.....	.....
623	T. J. McMillan No. 70.....	Union.....	Columbia G. & E. Co.....	1045	.....	.....	.....	.....
624	A. Briles No. 73.....	Sheridan....	Columbia G. & E. Co.....	.....	.....	.....	.....	.....
625	Lincoln L. A.....	Carroll.....	South Penn O. Co.....	.....	.....	.....	.....	.....

Lincoln County—Continued.

SALT SAND.		BIG LIME.		BIG INJUN SAND.		BEREA SAND.		Total Depth.	Producing Sand.	No. on Map.
Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness			
925	605	1575	185	1760	20	2261	27	2296	Berea	568
.....	.....	1503	20	1700	57	2206	25	2231	Berea; dry hole.	569
.....	.....	1425	196	1621	5	2123	14	2160	Berea; small gas in B. Injun.	570
491	369	1132	238	.....	.....	2104	8	2484	Dry hole.	571
.....	.....	1352	238	.....	.....	2104	8	2112	.....	572
600	545	1325	125	.....	.....	2038	20	2058	.....	573
.....	.....	1213	235	1768	105	.....	.....	3261	.....	574
.....	.....	1340	100	1535	19	2050	20	2260	Dry hole.	575
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	576
532	308	1020	143	.....	.....	.....	.....	1163	B. L.; oil, 50 bbls.; pay, 4'.	577
480	385	1025	210	1280	27	.....	.....	1307	B. I.; gas, 3 mil.; pay, 18'.	578
545	285	1015	247	1270	23	.....	.....	1303	B. I.; gas, 3 mil.; pay, 10'.	579
600	300	1075	163	.....	.....	.....	.....	1238	B. L.; oil, 20 bbls.; pay, 5'.	580
670	315	1179	290	1439	29	.....	.....	1468	B. I.; gas, 1½ mil.; pay, 10'.	581
550	298	1038	246	1300	21	.....	.....	1321	B. I.; gas, 1½ mil.; pay, 21'.	582
580	290	1056	149	.....	.....	.....	.....	1205	B. L.; oil, 18 bbls.; pay, 10'.	583
805	95	1084	153	.....	.....	.....	.....	1237	B. L.; oil, 10 bbls.; pay, 3'.	584
665	275	1145	223	1400	26	.....	.....	1426	B. I.; gas, 1 mil.; pay, 11'.	585
585	325	1086	248	1357	18	.....	.....	1375	B. I.; gas, 1½ mil.; pay, 17'; show oil in B. L.; pay, 2'.	586
.....	.....	1495	138	.....	.....	.....	.....	1633	B. L.; oil, 10 bbls.; pay, 1604-10.	587
.....	.....	1035	210	1249	36	.....	.....	1285	B. L.; gas, 1 mil.; pay, 1249-52.	588
525	465	1170	230	1458	7	1996	10	2006	Dry hole.	589
723	322	1195	227	1460	10	.....	.....	1963	Little gas, 742.	590
915	345	1367	148	.....	.....	.....	.....	1539½	Gas and oil, B. L.; pay, 3'.	591
960	320	1430	225	1690	35	2242	15	2257	Dry hole.	592
1300	9	1450	44	.....	.....	.....	.....	1647	B. L.; oil, 50 bbls.; pay, 5'.	593
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	594
652	320	.....	.....	1404	32	.....	.....	1436	B. I.; gas, 2½ mil.	595
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	596
915	125	1489	191	1686	20	2173	25	2198	Berea; oil and gas; pay, 8'.	597
.....	.....	1492	293	1720	17	.....	.....	2210	B. I.; gas.	598
.....	.....	1400	215	1640	50	2110	20	2130	B. L.; gas, 3 mil.; pay, 1475-85.	599
.....	.....	1395	90	.....	.....	2132	25	.....	.....	600
790	590	1452	183	1640	25	2134	29	2163	Berea; gas, 1½ mil.; pay, 29'.	601
760	585	1423	177	1605	55	2086	27	2115	Berea; gas, 1 mil.; pay, 27'.	602
995	315	1400	180	1590	25	2073	25	2098	Berea; gas, 1¼ mil.; pay, 25'.	603
1088	.....	.....	.....	.....	.....	.....	.....	.....	.....	604
.....	.....	1347	191	1538	62	2025	18	2050	Dry	605
816	606	1559	195	1767	67	2250	17	2272	Dry	606
856	562	1668	78	1746	85	2263	19	2708	Dry	607
.....	.....	.....	.....	.....	.....	2163	22	2360	Dry	608
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	609
.....	.....	986	248	1255	20	1799	11	1810	Berea; gas, ¼ mil.; B. L. gas, ½ mil.	610
680	180	1455	205	1670	30	2153	25	2178	Berea; gas, ½ mil.	611
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	612
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	613
610	330	1108	224	1373	21	1920	14	2006	Dry	614
750	310	1195	211	1435	65	2000	12	2012	Small show oil and gas.	615
620	390	1395	89	1930	12	.....	.....	1942	Berea; gas, ½ mil.; pay, 1932-36.	616
635	208	1140	215	1380	18	.....	.....	1398	B. I.; gas, 2½ mil.; pay, 1380-97.	617
510	340	1154	301	1630	50	.....	.....	1680	Dry hole.	618
1030	632	1709	181	1890	30	2390	23	2416	Berea; gas, 1½ mil.; pay, 2390-2413.	619
570	50	1073	227	1320	24	.....	.....	1344	B. I.; gas, 3 mil.; pay, 24'.	620
830	240	1405	205	1654	19	.....	.....	1673	B. I.; gas, 3 mil.; pay, 1655-70.	621
845	235	1455	189	1664	36	2190	.....	2215	B. L.; gas, 7½; pay, 1552-95.	622
1145	610	1797	178	1975	45	2474	25	2495	Berea; gas, pay, 25'.	623
547	368	1093	223	1325	35	.....	.....	1360	B. I.; gas, 3 mil.; pay, 9'.	624
820	230	1382	60	1442	128	2088	22	2635	Dry	625

Oil and gas in paying quantities have been obtained in Duval, Sheridan, Laurel Hill, Washington, Jefferson and Carroll districts, although drilling has been done in every district in the county.

The well records and a discussion of the various fields will now be given and taken up by magisterial districts.

Washington District, Oil Well Records.

Washington district is located in the northeastern part of Lincoln county and adjoins Duval district on the west, Kanawha county on the north and east, and Boone on the south.

Record of the Wm. Trimble Well No. 1 (L-430), Washington District.

Located on branch of Island creek, three miles south of Upper Falls; elevation, 755' A. T.

	Thickness Feet.	Total Feet.
Surface rock.....	40	40
Sand	20	60
Red rock.....	90	150
Shale and slate.....	100	250
Sand	60	310
Slate	150	460
Sand	40	500
Red rock.....	20	520
Slate	175	695
Lime	20	715
Slate	165	880
Sand	680	1560
Big Lime.....	200	1760
Big Injun sand.....	60	1820
Slate and shells.....	383	2203
Sand, "stray".....	1½	2204½
Slate	58½	2263
Berea Grit sand.....	20	2283
Slate to bottom of hole.....	5	2288

Showing oil of 35° gravity in Berea, estimated at 2 barrels natural per day.

Seaboard Fuel Company Well No. 2 (L-606), Washington District.

Located near the head of Ely fork, $3\frac{1}{2}$ miles west of MacCorkle; drilled by the American Oil & Development Co.; elevation, 815' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	75	75
Sand and water.....	37	112
Unrecorded	38	150
Coal and water.....	5	155
Unrecorded	32	187
Coal	3	190
Unrecorded	106	296
Coal	4	300
Unrecorded	15	315
Sand	32	347
Unrecorded	19	366
Sand and little gas.....	62	428
Unrecorded	10	438
Sand	40	478
Unrecorded	46	524
Sand	66	590
Unrecorded	20	610
Sand	40	650
Black slate.....	60	710
Sand	15	725
Unrecorded	7	732
Cow Run sand.....	40	772
Unrecorded	44	816
Sand	84	900
Unrecorded	18	918
Salt water.....	18	936
Unrecorded	2	938
Sand	166	1104
Unrecorded	16	1120
Sand	60	1180
Unrecorded	31	1211
Sand	211	1422
Red rock.....	3	1425
Unrecorded	37	1462
Red rock.....	16	1478
Slate	12	1490
Maxton sand.....	32	1522
Unrecorded	3	1525
Little Lime.....	32	1557
Unrecorded	2	1559
Big Lime.....	195	1754
Unrecorded	13	1767
Big Injun sand.....	67	1834
Unrecorded	403	2237
Coffee slate.....	13	2250
Berea Grit sand.....	17	2267
Bottom of well.....	..	2270

Dry in all formations.

Seaboard Fuel Company Well No. 3 (L-604), Washington District.

Located near the head of Cobbs creek, 3 miles northeast of Mac-Corkle, Washington District, Lincoln county; drilled by the American Oil & Development Company. Elevation, 775' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	19	19
Sand	151	170
Unrecorded	78	248
Coal	3	251
Sand	43	294
Unrecorded	2	296
Coal	3	299
Unrecorded	12	311
Coal	3	314
Unrecorded	1	315
Sand	63	378
Unrecorded	18	396
Sand	35	431
Unrecorded	127	558
Sand	42	600
Coal	3	603
Unrecorded	27	630
Sand	54	684
Unrecorded	58	742
Gas sand.....	332	1074
Unrecorded	14	1088
Sand	49	1137
Unrecorded	2	1139
Sand	70	1209
Unrecorded	6	1215
Sand	65	1280
Unrecorded	134	1414
Red rock.....	18	1432
Unrecorded	8	1440
Maxton sand	40	1480
Little Lime.....	35	1515
Pencil cave.....	3	1518
Big Lime.....	193	1711
Big Injun sand.....	58	1769
Unrecorded	81	1850
Lime	50	1900
Unrecorded	284	2184
Coffee slate.....	16	2200
Berea Grit, show of oil.....	18	2218
Bottom of well.....	..	2221

From the preceding records of the wells drilled in Washington district it is evident that the Berea sand is of sufficient thickness and purity to be a productive sand, but thus far neither oil nor gas has been found in paying quantities.

Oil Well Records in Jefferson District.

Jefferson district lies in the southeastern part of Lincoln county, and adjoins Union district on the north, Boone county on the east, Harts Creek district on the south, and Laurel Hill district on the west. No oil wells of commercial value have yet been drilled in this district, but several gas wells have been found.

James Dingess Well No. 1 (L-598), Jefferson District.

Located on Sanger branch of Mud river, one mile northeast of Spurlockville. Authority, Columbia Gas & Electric Company, Huntington, West Virginia; elevation of casing head, 820' A. T. B.

	Thickness Feet.	Total Feet.
Surface	25	25
Sand shells.....	5	30
Blue slate.....	20	50
Sand	20	70
Coal	3	73
Slate	7	80
Sand	30	110
Slate	40	150
Sand	40	190
Slate	40	230
Sand	32	262
Slate	23	285
Sand	35	320
Slate	20	340
Sand	10	350
Slate	50	400
Sand	12	412
Slate	25	437
Sand	53	490
Slate	120	610
Sand	30	640
Coal	6	646
Slate	39	685
Lime	15	700
Slate and sand.....	215	915
Slate	15	930
Sand	70	1000
Slate	7	1007
Sand	128	1135
Slate	7	1142
Sand	48	1190
Slate	10	1200
Lime	15	1215
Sand	130	1345
Slate	7	1352
Lime	8	1360

	Thickness Feet.	Total. Feet.
Sand	65	1425
Slate	55	1480
Little Lime.....	10	1490
Pencil cave.....	2	1492
Big Lime	223	1715
Red rock.....	5	1720
Big Injun sand.....	17	1737
Slate and shells	473	2210
Dry in all formations.		

Lincoln Land Association's Well No. 2 (L-600), Jefferson District.

Located on the Left fork of Mud river, 2 miles northeast of Spurlockville. Drilled by the South Penn Oil Company; elevation, 738' A. T. L.

	Thickness Feet.	Total Feet.
Soil	18	18
Slate	7	25
Coal	2	27
Sand	28	55
Lime	10	65
Slate	5	70
Sand	180	250
Slate	10	260
Sand	32	292
Coal, (No. 2 Gas).....	5	297
Slate	10	307
Lime	5	312
Sand	133	445
Slate	70	515
Sand	85	600
Slate and shells.....	45	645
Sand	230	875
Slate	25	900
Sand	240	1140
Lime	5	1145
Sand	55	1200
Slate and shells.....	40	1240
Sand	55	1295
Slate .....10' } Lime .....25 } Slate .....15 } Red rock .....20 } Lime .....15 } Slate .....15 }	Mauch Chunk..... 100	1395
Big Lime.....		
Sand		
Lime		
Sand		
Lime		
Red rock.....	10	1590
Sand, Big Injun.....	45	1635
Slate	15	1650

	Thickness Feet.	Total Feet.
Sand and shells.....	20	1670
Lime	100	1770
Slate	30	1800
Brown shale.....	332	2132
Berea Grit.....	25	2157
Slate to bottom, dry.....	14	2171

Lincoln Land Association's Well No. 3 (L-608), Jefferson District.

Located on Upton branch of Mud river, one mile and a half southwest of Spurlockville; drilled by the South Penn Oil Company; elevation, 840' A. T. L.

	Thickness Feet.	Total Feet.
Soil	30	30
Sand	25	55
Coal	5	60
Sand	55	115
Slate	45	160
Sand	85	245
Lime	30	275
Sand	40	315
Slate	35	350
Sand	39	389
Coal, No. 2 Gas.....	4	393
Lime	17	410
Slate	30	440
Lime	10	450
Sand	30	480
Slate	68	548
Sand	22	570
Slate	55	625
Sand	25	650
Slate	90	740
Salt sand, broken, irregular.....	140	880
Slate	45	925
Sand	105	1030
Lime	30	1060
Slate	60	1120
Sand	15	1135
Slate	5	1140
Sand	100	1240
Coal, (New River).....	6	1246
Lime	9	1255
Slate	5	1260
Coal, (New River).....	3	1263
Sand	87	1350
Slate .....15'	} Mauch Chunk.....	128
Lime 5		
Red rock..... 3		
Lime 7		
Slate .....15		
Lime .....15	}	1478
Slate .....68		

	Thickness Feet.	Total. Feet.
Big Lime.....	147	1625
Big Injun sand.....	20	1645
Slate	5	1650
Slate and shells.....	150	1800
Squaw sand.....	65	1865
Slate	155	2020
Lime	35	2055
Slate	108	2163
Berea Grit.....	22	2185
Broken sand and slate to bottom, dry.....	175	2360

Oil Well Records in Duval District.

Duval district lies in the northern part of Lincoln county and adjoins Carroll and Union districts on the west, Putnam county on the north, Washington district on the east, and Jefferson on the south. Duval district is rich in oil and gas.

Noah Turley Well No. 1 (L-416), Duval District.

Located on Laurel fork of Horse creek, one mile and three-quarters north of Woodville, and drilled by the United Fuel Gas Company; elevation, 805' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	6	6
Sand	279	285
Slate and shells.....	290	575
Sand	95	670
Slate	5	675
Salt sand, water, 785'.....	625	1300
Shale, red.....85' }	Mauch Chunk..... 185	1485
Shale, soft.....55' }		
Maxton sand.....10' }		
Little Lime.....30' }		
Pencil cave..... 5' }		
Big Lime, gas at 1620'.....	200	1685
Red rock.....	35	1720
Sand and shells.....	130	1850
Shale and shells.....	321½	2171½
Berea sand to bottom, gas.....	19½	2191

Horse Creek Land Company's Well No. 1 (L-417), Duval District.

Located on Laurel creek of Horse creek, $\frac{1}{4}$ mile north of Woodville, and drilled by the United Fuel Gas Company; elevation, 695' A. T. B.

	Thickness Feet.	Total Feet.
Loose soil and gravel.....	13	13
Sand	17	30
Lime	50	80
Slate	40	120
Lime	90	210
Sand	15	225
Coal	5	230
Black slate.....	60	290
Lime	30	320
Slate	15	335
Lime	74	409
Slate	47	456
Sand, water, salt.....	34	490
Sand, salt water, 555'.....	110	600
Slate	5	605
Sand	125	730
Slate	5	735
Salt sand, gas, 740'; salt water, 770'.....	465	1200
Slate .....80' } Little Lime.....20 } Mauch Chunk.....	105	1305
Pencil cave..... 5 }		
Big Lime	200	1505
Big Injun sand	35	1540
Black slate	10	1550
Slate and shells.....	150	1700
Black slate	319	2019
Berea Grit, gas 750,000 cu. ft.....	17	2036

Neri Kenney Well No. 1 (L-565), Duval District.

Located on the upper farm on Sugartree fork of Mud river, $2\frac{1}{2}$ miles southeast of Griffithsville; drilled by the Ohio Fuel Oil Company; elevation, 885' A. T. B.

	Thickness Feet.	Total Feet.
Sand	190	190
Slate	40	230
Sand	127	357
Slate	3	360
Sand	20	380
Slate and shells.....	80	460
Sand	30	490
Slate and shells.....	210	700
Salt sand	650	1350

	Thickness Feet.	Total Feet.
Slate	0'	
Red rock.....	10	
Slate	60	
Maxton sand.....	25	Mauch Chunk.. 124 1474
Little Lime.....	16	
Pencil cave.....	3	
Big Lime	191	
Red rock	75	1665
Big Injun sand.....	15	1740
Slate and shells.....	417	1755
Berea sand, oil.....	24	2172
Slate to bottom of hole.....	5	2196
		2201
3,000,000 cubic feet of gas at 1565 feet; oil well in Berea sand.		

B Woodrum Well No. 1 (L-560), Duval District.

Located on Sugartree fork of Mud river, 2¼ miles southwest of Yawkey, and drilled by the Ohio Fuel Oil Company in 1909; elevation, 865' A. T. B.

	Thickness Feet.	Total Feet.
Slate	10	10
Sand	35	45
Slate	45	90
Sand	74	164
Slate	51	215
Sand	90	305
Slate	40	345
Sand	50	395
Slate	5	400
Sand	68	468
Slate	42	510
Sand	122	632
Slate	62	694
Lime	42	736
Slate	67	803
Sand	134	937
Slate	43	980
Salt sand, hole full of water, 1025'.....	585	1565
Maxton sand	20	1585
Little Lime	20	1605
Pencil cave	5	1610
Big Lime, gas, 1705'-1715'.....	205	1815
Big Injun sand.....	60	1875
Slate and shells.....	428	2303
Berea sand, oil.....	27	2330

Mary Mason Well No. 5 (L-554), Duval District.

Located on Sugartree fork of Mud river, 2 miles south of Griffiths-ville, and drilled by the Ohio Fuel Oil Company; elevation 685' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	32	32
Sand	368	400
Slate	25	425
Sand	175	600
Slate and shells.....	200	800
Salt sand, hole full of water, 1290'.....	590	1390
Slate	25	1415
Maxton sand	25	1440
Little Lime	25	1465
Pencil cave	2	1467
Big Lime, slight gas, 1557'.....	180	1647
Slate and lime.....	499	2146
Berea sand, oil.....	20	2166
Slate to bottom.....	5	2171

Mary Mason Well No. 3 (L-522), Duval District.

Located on Big branch of Sugartree fork, one mile south of Griffiths-ville, and drilled by the Ohio Fuel Oil Company; elevation 1105' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	300	300
Red rock	30	330
Unrecorded	890	1220
Sand, Salt	616	1836
Little Lime	30	1866
Pencil cave.....	13	1879
Big Lime	211	2090
Big Injun sand.....	60	2150
Unrecorded	427	2577
Berea sand, oil.....	23	2600

Oil Well in Berea sand.

Lincoln Land Association's Well No. 42 (L-315), Duval District.

Located on Big branch of Sugartree fork, one mile south of Griffiths-ville; authority, Guyan Oil Company; elevation, 912' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	345	345
Coal, No. 5 Block?.....	3	348
Unrecorded	653	1001
Salt sand	484	1485
Unrecorded	185	1670
Little Lime	30	1700

	Thickness Feet.	Total Feet.
Pencil cave	4	1704
Big Lime	192	1896
Big Injun sand.....	40	1936
Unrecorded	451	2387
Berea sand, oil.....	26	2413
Slate to bottom.....	2	2415

The well starts about 180 to 185 feet above the Upper Freeport coal.

A. King's Well No. 21 (L-304), Duval District.

Located on Sugartree fork, one mile south of Griffithsville; authority, Columbia Gas & Electric Company; elevation, 667' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	170	170
Coal, Stockton	4	174
Unrecorded	456	630
Gas sand	310	940
Unrecorded	6	946
Salt sand	334	1280
Unrecorded	120	1400
Little Lime	32	1432
Pencil cave	12	1444
Big Lime, gas $\frac{1}{2}$ million, 1555'-1570'.....	166	1610
Big Injun sand	56	1666
Unrecorded	444	2110
Berea sand, Gas, $4\frac{1}{2}$ million cu. ft., 2111'- 2120'	18	2128
Total depth		2129

This well starts 60 to 65 feet below the Upper Freeport coal, and is located at the extreme western edge of the oil producing region in the Griffithsville field.

J. L. King's Well (Lincoln Land Association No. 8) (L-307), Duval District.

Located on Big branch of Sugartree fork, one mile southwest of Griffithsville; authority, Columbia Gas & Electric Company; elevation, 952' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	895	895
Gas sand	105	1000
Unrecorded	225	1225
Salt sand	315	1540
Unrecorded	108	1648
Little Lime	35	1683
Pencil cave	4	1687

	Thickness Feet.	Total. Feet.
Unrecorded	56	1743
Big Lime	191	1934 °
Big Injun sand	30	1964
Unrecorded	116	2080
Limestone	70	2150
Unrecorded	273	2423
Berea sand, oil, 2424'-2444'	21	2444

25 barrels daily from Berea sand; completed March 26, 1908.

This well starts about 225 to 230 feet above the Upper Freeport coal.

A. G. Grass' Well No. 3 (L-295), Duval District.

Located on Straight fork, $\frac{3}{4}$ mile southeast of Griffithsville; authority, Big Creek Development Company; elevation, 990' A. T. B.

	Thickness Feet.	Total Feet.	
Soil and gravel	12	12	
Slate and shells	100	112	
Red rock	30	142	
Sand	10	152	
Slate	80	232	
Sand	20	252	
Coal, Upper Freeport	2	254	Allegheny Series, 178'
Sand, (Burning Springs)	101	355	
Slate	75	430	
Sand, (Homewood)	110	540	
Slate	125	665	Pottsville Series, 1315'
Sand	80	745	
Slate	125	870	
Sand	100	970	
Slate	40	1010	
Sand	35	1045	
Slate	60	1105	
Salt sand, salt water, 1120'; hole full, 1170'	640	1745	
Little Lime	42	1787	
Pencil cave	3	1790	
Big Lime	180	1970	
Big Injun sand	55	2025	
Slate	80	2105	
Lime shells	125	2230	
Slate	193	2423	
Black slate	20	2443	
Berea sand, oil	21	2464	
Slate to bottom	9	2473	

A. Grass' Well No. 6 (L-292), Duval District.

Located on Straight fork, one mile south of Griffithsville; authority, Big Creek Development Company; elevation, 1115' A. T. B.

	Thickness Feet.	Total Feet.
Soil and clay.....	14	14
Sand	20	34
Red rock	30	64
Sand	60	124
Slate	125	249
Sand	90	339
Slate	40	379
Coal, Upper Freeport.....	2	381
Sand	81	462
Slate	110	572
Sand	210	782
Slate	125	907
Sand	90	997
Slate	80	1077
Sand	60	1137
Slate	73	1210
Salt sand	626	1836
Little Lime	40	1876
Pencil cave	7	1883
Big Lime	180	2063
Big Injun sand	40	2103
Slate	80	2183
Lime shells	150	2333
Slate	225	2558
Black slate	17	2575
Berea sand, oil.....	23	2598
Slate to bottom.....	5	2603

Austin Griffith's Well No. 7 (L-39), Duval District.

Located on Straight fork, $\frac{1}{2}$ mile south of Yawkey; authority, South Penn Oil Company; elevation, 1120' A. T. B.

	Thickness Feet.	Total Feet.
Surface	22	22
Slate	138	260
Sand	160	420
Coal, Upper Freeport	2	422
Sand	58	480
Slate	15	495
Sand	140	635
Slate	35	670
Sand	50	720
Slate	15	735
Sand	65	800
Slate	20	820
Lime	26	846
Slate	54	900

	Thickness Feet.	Total. Feet.
Sand	90	990
Slate	15	1005
Sand	50	1055
Slate	25	1080
Sand	20	1100
Slate	40	1140
Sand	20	1160
Slate	10	1170
Salt sand	615	1785
Slate	5	1790
Red lime	10	1800
Slate	5	1805
Sand, Maxton	35	1840
Slate	3	1843
Lime	42	1885
Pencil cave	5	1890
Big Lime	190	2080
Big Injun sand	90	2170
Slate	45	2215
Lime	85	2300
Slate	266	2566
Berea sand, oil	23	2589

This well is located near the center of the Griffithsville oil field as the present development shows.

Columbus Griffith's Well No. 2 (L-164), Duval District.

Located on Porter fork, one mile southeast of Yawkey; authority, Big Creek Development Company; elevation, 700' A. T. B.

	Thickness Feet.	Total Feet.	
Soil and quicksand	37	37	Allegheeny Series, 190'
Sand	20	57	
Slate and shells	83	140	
Coal, (No. 5 Block?)	2	142	
Sand	16	158	
Slate	10	168	Pottsville Series, 1225'
Coal	1	169	
Slate	21	190	
Sand, (Homewood)	80	270	
Slate and sand	440	710	
Slate	40	750	Mauch Chunk, 90'
Salt sand, hole full of water at 880'	665	1415	
Slate	10	1425	
Red rock	10	1435	
Lime	20	1455	
Slate	10	1465	
Little Lime	35	1500	
Pencil cave	5	1505	
Big Lime	190	1695	
Big Injun sand	60	1755	

	Thickness Feet.	Total. Feet.
Slate	60	1815
Lime shells	150	1965
Slate	200	2165
Black slate	20	2185
Berea sand, oil.....	21	2206
Slate to bottom.....	4	2210

This well starts at the horizon of the Upper Freeport coal.

Ephriam Griffith's Well No. 4 (L-179), Duval District.

Located on branch of Porter fork, one mile and a quarter south-east of Yawkey; authority, Big Creek Development Company; elevation, 795' A. T. B.

	Thickness Feet.	Depth Feet.
Unrecorded, water, 280'.....	474	474
Sand and lime.....	16	490
Coal, (No. 2 Gas?).....	2	492
Slate and shells.....	133	625
Sand and lime.....	275	900
Slate	25	925
Salt sand, water, 960'.....	615	1540
Slate	6	1546
Little Lime	39	1585
Pencil cave	5	1590
Big Lime	190	1780
Big Injun sand	70	1850
Slate and shells.....	405	2255
Brown shale	9	2264
Berea sand, oil.....	17	2281
Slate	2	2283

This well is a little east of the center of the Griffithsville field as marked by present developments.

William Keeling Well No. 1 (L-110), Duval District.

Located one mile and three-quarters east of Yawkey; authority, Big Creek Development Company; elevation, 1085' A. T. B.

	Thickness Feet.	Depth Feet.
Soil and clay	16	16
Slate	5	21
Red rock	40	61
Sand	20	81
Slate	110	191
Sand	80	271
Slate	125	396
Sand	40	436
Slate and sand.....	684	1120
Slate	40	1160

	Thickness Feet.	Total Feet.
Salt sand	680	1840
Slate	10	1850
Little Lime	65	1915
Pencil cave	5	1920
Big Lime	180	2100
Big Injun sand	70	2170
Slate	70	2240
Squaw sand	60	2300
Slate	80	2380
Lime shell	30	2410
Slate	50	2460
Lime shell	30	2490
Slate	100	2590
Brown slate	5	2595
Berea sand, oil	21	2616

This well starts about 385 to 390 feet above the Upper Freeport coal.

F. M. Midkiff Well No. 6 (L-242), Duval District.

Located on Porter fork, 2 miles east of Yawkey; authority, Big Creek Development Company; elevation, 875' A. T. B.

	Thickness Feet.	Total Feet.
Soil and clay	16	16
Sand	19	35
Slate	40	75
Sand	25	100
Slate	60	160
Sand	15	175
Slate	40	215
Sand	35	250
Slate	65	315
Coal	5	320
Slate and sand	600	920
Slate	40	960
Salt sand, hole full of salt water, 1030'	605	1565
Red rock	10	1575
Slate	30	1605
Little Lime	40	1645
Pencil cave	5	1650
Big Lime	190	1840
Big Injun sand	90	1930
Slate	80	2010
Lime shell	125	2135
Slate	180	2315
Brown shale	20	2335
Berea sand, oil	19	2354
Slate to bottom	6	2360

This well starts about 100 feet above the Upper Freeport coal. Hole full of salt water at 1030 feet.

A. P. Wade Well No. 1 (L-223), Duval District.

Located on Porter fork, 2¼ miles southeast of Yawkey; authority, Big Creek Development Company; elevation, 920' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	20	20
Sand	360	380
Slate	10	390
Lime and sand.....	80	470
Coal, (Stockton?).....	5	475
Sand and shells.....	415	890
Sand and lime.....	180	1070
Slate	10	1080
Salt sand, hole full of water, 1085'.....	600	1680
Slate	5	1685
Little Lime	25	1710
Big Lime.....	195	1905
Big injun sand.....	60	1965
Slate and shells.....	105	2070
Lime and sand.....	95	2165
Slate and shells.....	223	2388
Brown shale.....	18	2406
Berea sand, oil and gas, 2408'.....	18	2424

This well is near the eastern edge of the Griffithsville field, as shown by present developments.

M. A. Lawrence's Well No. 2 (L-376), Duval District.

Located on Bear fork, one mile and a half northeast of Yawkey; authority, Big Creek Development Company.

	Thickness Feet.	Total Feet.
Unrecorded	14	14
Red rock.....	100	114
White slate.....	89	203
Red rock.....	40	243
White slate.....	47	290
Red rock.....	37	327
Sand	63	390
White slate.....	27	417
Sand	56	473
White slate.....	23	496
Sand	22	518
White slate.....	82	600
Sand	27	627
Slate and sand shells.....	93	720
Sand	33	753
Coal, Coalburg?.....	2	755
Slate	48	803
Sand	27	830
Coal, Winifrede?.....	2	832
Sand	75	907

	Thickness Feet.	Total Feet.
Slate	89	996
Sand	32	1028
Slate and sand shells.....	124	1152
Sand	30	1182
Slate	40	1222
Sand	30	1252
Slate	23	1275
Salt sand, salt water, 1304'	539	1814
Slate	11	1825
Maxton sand	9	1834
Slate	14	1848
Little Lime	31	1879
Pencil cave.....	6	1885
Big Lime, gas, 2038'	165	2050
Big Injun sand	62	2112
Slate shells.....	100	2212
Black lime.....	80	2292
Slate and shells.....	263	2555
Slate	18	2573
Berea sand	20	2593

Oscar Bell's Well No. 6 (L-387), Duval District.

Located on the head of Valley fork, $2\frac{1}{2}$ miles northeast of Gratz fithsville; authority, Big Creek Development Company; elevation, 1080' A. T. B.

	Thickness Feet.	Total Feet.	
Soil	15	15	
Red rock.....	85	100	
Slate	50	150	
Red rock.....	25	175	
Slate	25	200	
Sand	25	225	
Slate	115	340	
Sand	30	370	
Slate	30	400	
Sand	30	430	
Slate	30	460	
Sand	70	530	Pottsville Series, 1330'
Slate	50	580	
Sand	320	900	
Slate and shells.....	70	970	
Sand	30	1000	Mauch Chunk, 85'
Slate and shells.....	150	1150	
Sand and slate.....	80	1230	
Salt sand, water, 1310'; slight gas, 1380'	560	1790	
Slate and shells.....	40	1830	
Little Lime	35	1865	
Pencil cave.....	10	1875	
Big Lime	170	2045	
Big Injun sand	80	2125	
Berea shales.....	424	2549	
Berea sand, oil	21	2570	

This well is located at the extreme northern edge of the oil development in the Griffithsville field.

Oscar Bell's Well No. 4 (L-385), Duval District.

Located on the head of Valley fork, 2½ miles northeast of Griffithsville; authority, Big Creek Development Company; elevation, 1000' A. T. B.

	Thickness Feet.	Total Feet.	
Surface	10	10	
Red rock.....	40	50	
Sand	20	70	
Slate	30	100	
Shale	80	180	
Red rock.....	90	270	
Sand	70	340	
Slate	45	385	
Sand	15	400	
Slate and shells.....	50	450	
Sand	360	810	
Slate	220	1030	Pottsville Series, 1260'
Sand	85	1115	
Slate	35	1150	
Salt sand.....	560	1710	Mauch Chunk, 88'
Slate	60	1770	
Black lime.....	25	1795	
Pencil cave.....	3	1798	
Big Lime.....	180	1978	
Big Injun sand.....	62	2040	
Shale	418	2458	
Brown shales.....	20	2478	
Berea sand, oil.....	24	2502	

This well starts about 290 to 300 feet above the Upper Freeport coal.

Leonard Oxley Well No. 5 (L-371), Duval District.

Located on Valley fork, one mile and three-quarters northeast of Griffithsville; authority, Big Creek Development Company; elevation, 1080' A. T. B.

	Thickness Feet.	Total Feet.
Soil	16	16
Red rock.....	14	30
Slate shells.....	20	50
Red rock.....	45	95
Slate	115	210
Sand	30	240
Slate	60	300
Red rock.....	45	345
Slate 2' of coal at 410' (Upper Freeport)...	155	500

	Thickness Feet.	Total Feet.	
Lime	20	520	
Sand	110	630	
Slate	60	690	
Sand	110	800	
Slate	20	820	
Sand	80	900	
Slate	30	930	Pottsville Series, 1310'
Sand	80	1010	
Slate	50	1060	
Sand	90	1150	
Slate	25	1175	
Salt sand, hole full of water, 1280'.....	655	1830	
Black lime.....	35	1865	
Pencil cave.....	5	1870	
Big Lime, slight gas, 1965'.....	180	2050	
Big Injun sand.....	70	2120	
Shales	388	2508	
Brown shales.....	20	2528	
Berea sand, oil.....	25	2553	

G. T. Lawrence Well No. 4 (L-407), Duval District.

Located on Valley fork, one mile and three-quarters northeast of Griffithsville; authority, Holly Oil & Development Company; elevation, 940' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	16	16
Red rock.....	210	226
Sand	60	286
Unrecorded	135	421
Sand	89	510
Unrecorded	15	525
Sand	299	824
Unrecorded	192	1016
Sand	25	1041
Unrecorded	57	1098
Sand	26	1124
Unrecorded	22	1146
Salt sand.....	508	1654
Maxton sand.....	47	1701
Little Lime.....	35	1736
Peucil cave.....	4	1740
Big Lime	168	1908
Big Injun sand.....	68	1976
Slate	83	2059
Black lime.....	90	2149
Slate and shells.....	260	2409
Coffee slate.....	15	2424
Berea sand, oil.....	23	2447
Slate to bottom.....	3	2450

E. White Well No. 1 (L-162), Duval District.

Located on Billy branch, one mile and a quarter north of Griffiths-ville; authority, Holly Oil & Development Company; elevation, 735' A. T. B.

	Thickness Feet.	Total Feet.
Earth	15	15
Slate and sand.....	145	160
Sand	40	200
Slate	75	275
Coal	5	280
Slate	20	300
Sand	100	400
Slate	50	450
Sand	50	500
Slate	100	600
Sand	100	700
Slate	25	725
Sand	75	800
Slate	75	875
Sand	25	900
Salt sand, gas, 910'; water, 925'.....	555	1455
Big Lime.....	235	1690
Big Injun sand.....	42	1732
Slate	68	1800
Lime and shells.....	115	1915
Slate	235	2150
Slate	15	2165
Black slate.....	18	2183
Berea Grit, gas and oil.....	20	2203

This well starts 50 to 55 feet above the Upper Freeport coal. It is on the northeastern edge of the Griffithsville field.

Page Thornton's Well No. 4 (L-161), Duval District.

Located on Billy branch, one mile northwest of Griffithsville; authority, Holly Oil & Development Company; elevation, 680' A. T. L.

	Thickness Feet.	Total Feet.	
Surface	24	24	
Sand	76	100	
Slate	40	140	
Sand	115	255	Pottsville Series, 1235'
Slate	20	275	
Slate	85	360	
Sand	40	400	
Slate	175	575	
Sand	35	610	
Slate	55	665	
Sand	65	730	
Slate	80	810	
Sand, water, 844'.....	565	1375	

	Thickness Feet.	Total Feet.
Big Lime	220	1595
Big Injun sand	40	1635
Slate	115	1750
Lime	30	1780
Lime and slate	120	1900
Slate	196	2096
Berea Grit, gas, 1,089,000 cu. ft.	15	2111

This well starts just above the Upper Freeport coal horizon and is about one mile and a quarter northwest of the nearest oil well in the Griffithsville field.

Lincoln Land Association's Well No. 34 (L-10), Duval District.

Located on Middle fork of Mud river, about one mile west of Griffithsville; authority, Columbus Gas & Electric Company; elevation, 863' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	935	935
Salt sand	595	1530
Unrecorded	35	1565
Little Lime	35	1600
Pencil cave	8	1608
Big Lime	180	1788
Unrecorded	7	1795
Big Injun sand	25	1820
Unrecorded	454	2274
Berea sand, gas, 2 million feet	26	2300
Slate to bottom	2	2302

This well is on the extreme western edge of the Griffithsville field and starts 180 to 185 feet above the Upper Freeport coal.

Lincoln Land Association's Well No. 33 (L-603), Duval District.

Located on Merrick creek, one mile and a third southwest of Griffithsville; authority, Columbia Gas & Electric Company; elevation, 673' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	125	125
Coal	5	130
Unrecorded	605	735
Gas sand	250	985

	Thickness Feet.	Total Feet.
Unrecorded	10	995
Salt sand.....	315	1310
Unrecorded	55	1365
Little Lime.....	30	1395
Pencil cave.....	5	1400
Big Lime.....	180	1580
Unrecorded	10	1590
Big Injun sand.....	25	1615
Unrecorded	458	2073
Berea sand, gas, 1¼ million cu. ft.....	25	2098

This well starts just above the Upper Freeport coal horizon and is on the extreme western edge of the Griffithsville oil field.

Emma Griffith's Well No. 5 (L-24), Duval District.

Located in Yawkey; authority, Big Creek Development Company; elevation, 700' A. T. Aneroid.

	Thickness Feet.	Total Feet.
Soil and clay.....	10	10
Slate	20	30
Sand	40	70
Slate	60	130
Sand, water at 180'.....	100	230
Coal, (Stockton?).....	3	233
Slate	97	330
Sand	60	390
Slate and sand.....	435	825
Salt sand, hole full of water, 900'.....	630	1455
Little Lime	30	1485
Pencil cave.....	5	1490
Big Lime	185	1675
Big Injun sand.....	50	1725
Slate	75	1800
Shells	150	1950
Slate	215	2165
Brown shale.....	20	2185
Berea sand, slight oil.....	22	2207
Slate	67	2274
Shell	18	2292
Slate	58	2350
Shell	4	2354
Slate	46	2400
Shell	75	2475
Slate	675	3150
Brown shale.....	150	3300
Black shale.....	50	3350
Shell	40	3390
Slate	150	3540
Brown shale.....	150	3690
Black slate to bottom.....	312	4002

This well starts at the Upper Freeport coal horizon, and is located almost in the center of the Griffithsville oil field. This is the deepest well drilled in the field and the third deepest in the State. No oil or gas was found in any of the sands below the Berea.

Union District.

Union district lies north of the center of Lincoln county and is bounded on the north by Carroll and Duval districts; on the east by Duval and Jefferson, and on the west by Laurel Hill and Sheridan districts.

James Linkous No. 1 (L-568), Union District.

Located on Sycamore fork, $3\frac{1}{2}$ miles southwest of Yawkey; authority, Big Creek Development Company; elevation, 855' A. T. B.

	Thickness Feet.	Depth Feet.
Soil and gravel.....	13	13
Slate	177	190
Sand	85	275
Slate	5	280
Sand	210	490
Slate and shells.....	130	620
Sand	140	760
Slate	80	840
Gas sand.....	85	925
Salt sand.....	605	1530
Little Lime.....	40	1570
Pencil cave.....	5	1575
Big Lime.....	185	1760
Big Injun sand.....	20	1780
Slate	110	1890
Squaw sand.....	15	1905
Slate	34	1939
Sand	24	1963
Slate	37	2000
Lime shells.....	12	2012
Slate	228	2240
Black shell.....	21	2261
Berea sand, gas.....	27	2288
Slate to bottom.....	8	2296

This well is about one mile and a quarter southwest of the nearest oil wells on the southwestern edge of the present development in the Griffithsville oil field, and it starts about 50 to 60 feet above the Upper Freeport coal.

Washington Plumley's Well No. 2 (L-597), Union District.

Located near head of Big Laurel creek of Mud river, 3½ miles southwest of Griffithsville; authority, Columbia Gas & Electric Company; elevation, 785' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	645	645
Gas sand.....	60	705
Unrecorded	210	915
Salt sand.....	125	1040
Unrecorded	405	1445
Little Lime.....	39	1484
Pencil cave.....	5	1489
Big Lime.....	191	1680
Unrecorded	3	1686
Big Injun sand.....	20	1706
Unrecorded	467	2173
Berea sand, neither gas nor oil.....	25	2198

This well starts 15 to 20 feet below the Upper Freeport coal and came in dry. It is about 2 miles west of the nearest gas well and 3 miles southwest of the nearest producing oil well in the southwestern edge of the Griffithsville oil field.

D. G. Courtney Well No. 1 (L-569), Union District.

Located on Lick fork of Big creek of Mud river, 3 miles northeast of Spurlockville; authority, Thomas M. Galey; elevation, 810' A. T. B.

	Thickness Feet.	Total Feet.
Conductor	16	16
Sand	34	50
Coal, (No. 5 Block).....	6	56
Sand	113	169
Slate	56	225
Slate and sand shells.....	275	500
Coal, (No. 2 Gas?).....	5	505
Sand, gas, 507'.....	50	555
Unrecorded	85	640
Gas sand (hard).....	170	810
Slate	50	860
Salt sand No. 1, hole full of water, 1000'...	220	1080
Slate	110	1190
Salt sand No. 2.....	85	1275
Slate	5	1280
Salt sand No. 3.....	92	1372
Black lime.....	95	1467
Slate	5	1472
Little Lime.....	24	1496
Slate, (Pencil cave).....	7	1503
Big Lime.....	200	1703
Big Injun sand (red, mixed with pebbles) ..	57	1760
Slate and shells, show of oil, 1773'.....	446	2206
Berea Grit, gas, 2206' - 2216'.....	25	2231

This well starts 50 feet above the No. 5 Block coal, and it and the Foster Sperry well, about one mile southeast are the only wells that have been drilled in this immediate neighborhood.

Sheridan District.

Sheridan district lies in the northwestern part of Lincoln and adjoins Cabell county on the north, Carroll and Union districts on the east, Laurel Hill district on the south, and Wayne and Cabell counties on the west.

C. L. McComas' Well No. 114 (L-445), Sheridan District.

Located on Twomile creek of Guyandot river, $2\frac{3}{4}$ miles northeast of Branchland; authority, Columbia Gas & Electric Company; elevation, 792' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	670	670
Salt sand	470	1140
Unrecorded	75	1215
Little Lime	25	1240
Sand	10	1250
Big Lime	225	1475
Unrecorded	15	1490
Big Injun, gas, 1495'-1517' (1 million)	42	1532

This well is on the extreme northeastern edge of the present development in the Branchfield oil field.

I. L. Burger's Well No. 138 (L-622), Sheridan District.

Located on Two Mile creek, $2\frac{1}{2}$ miles northeast of Branchland; authority, Columbia Gas & Electric Company.

	Thickness Feet.	Total Feet.
Unrecorded	845	845
Salt sand	235	1080
Unrecorded	345	1425
Little Lime	25	1450
Pencil cave	5	1455
Big Lime, gas, $\frac{1}{2}$ million, 1552'-1595'	189	1644
Unrecorded	20	1664
Big Injun sand	36	1700
Unrecorded	490	2190
Berea sand, gas, 2192'	10	2200
Slate to bottom	15	2215

This well is also on the northeastern edge of present development in the Branchland oil and gas field.

Lincoln Land Association's Well No. 103 (L-449), Sheridan District.

Located on Twomile creek, 2½ miles east of Branchland; authority, Columbia Gas & Electric Company; elevation, 744' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	600	600
Salt sand.....	240	840
Unrecorded	303	1143
Little Lime.....	4	1147
Unrecorded	8	1155
Pencil cave.....	7	1162
Big Lime.....	229	1391
Unrecorded	30	1421
Big Injun sand, gas, ¾ million, 1425' - 1450'.	34	1455

This well is on the extreme eastern edge of the present development in the Branchland oil and gas field.

Lincoln Land Association's Well No. 82 (L-452), Sheridan District.

Located on the Right fork of Twomile creek, 2 miles southeast of Branchland; authority, Columbia Gas & Electric Company.

	Thickness Feet.	Total Feet.
Unrecorded	615	615
Salt sand.....	200	815
Unrecorded	392	1207
Pencil cave.....	8	1215
Big Lime.....	225	1440
Unrecorded	19	1459
Big Injun sand, gas, 2 million cu. ft., 1461'-1476'	17	1476

J. R. Branch's Well No. 193 (L-474), Sheridan District.

Located on the Guyandot river, one mile and a third southeast of Branchland; authority, United Fuel Gas Company; elevation, 960' A. T. B.

	Thickness Feet.	Total Feet.
Surface, 10" casing.....	20	20
Slate	42	62
Sandstone	80	142
Slate	61	203

	Thickness Feet.	Total Feet.
Sandstone	142	345
Slate and shells.....	182	527
Sandstone	121	648
Slate, shelly.....	249	897
Sandstone, big flow salt water, 960'.....	351	1248
Slate and shells.....	110	1358
Limestone	8	1366
Slate	23	1389
Red rock.....	19	1408
Limestone	212	1620
Slate	29	1649
Big Injun sand, gas.....	42	1691

This well starts about 190 to 200 feet above the Stockton-Lewiston coal bed.

J. R. Branch's Well No. 197 (L-478), Sheridan District.

Located on the Guyandot river, 2 miles south of Branchland; authority, United Fuel Gas Company; elevation, 690' A. T. B.

	Thickness Feet.	Total Feet.
Sand	40	40
Slate	75	115
Sand	45	160
Slate	104	264
Sand	12	276
Slate	54	330
Coal, (No. 2 Gas).....	5	335
Slate	6	341
Sand	40	381
Slate	93	474
Sand	116	590
Slate	2	592
Sand	273	865
Slate	20	885
Coal	2	887
Slate	38	925
Lime	12	937
Sand	43	980
Red rock.....	5	985
Slate	15	1000
Lime	5	1005
Slate	12	1017
Red rock.....	10	1027
Slate	25	1052
Sand	14	1066
Slate	9	1075
Lime	225	1300
Red rock.....	5	1305
Slate	15	1320
Red rock.....	7	1327
Sand, gas.....	32	1359
Slate	1	1360

This well starts about 100 feet below the Stockton- Lewiston coal.

Inez McComas' Well No. 1 (L-468), Sheridan District.

Located on Guyandot river, 1 mile north of Branchland; authority, South Penn Oil Company; elevation, 610' A. T. B.

	Thickness Feet.	Total Feet.
Soil	15	15
Unrecorded	30	45
Coal	3	48
Slate	8	56
Sand	44	100
Slate	65	165
Sand	120	285
Coal	5	290
Slate	60	350
Sand	120	470
Coal	5	475
Lime	5	480
Slate	85	565
Salt sand.....	390	955
Red rock.....	140	1095
Little Lime.....	30	1125
Pencil cave.....	5	1130
Big Lime	167	1297
Red rock.....	67	1364
Big Injun sand, gas.....	15	1379

This well is located at a point but a short distance from where the measures begin to rise very rapidly toward Branchland.

A. Briles' Well No. 73 (L-624), Sheridan District.

Located on the Guyandot river, $\frac{1}{2}$ mile north of Branchland; authority, Columbia Gas & Electric Company; elevation 595' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	370	370
Coal, (No. 2 Gas).....	2	372
Unrecorded	164	536
Gas sand.....	8	544
Unrecorded	3	547
Salt sand.....	368	915
Unrecorded	135	1050
Little Lime.....	20	1070
Unrecorded	23	1093
Big Lime.....	220	1313
Unrecorded	12	1325
Big Injun sand, gas, 3 million cu. ft.....	35	1360

This well starts 15 to 20 feet above the Stockton-Lewis-ton coal.

Branchland Coal Company's Well No. 186 (L-480), Sheridan District.

Located on Branch of Fourmile creek, one mile west of Branchland; authority, United Fuel Gas Company; elevation, 620' A. T. B.

	Thickness Feet.	Total Feet.
Surface, 10" casing.....	21	21
Slate	40	61
Sandstone	16	77
Slate	18	95
Sandstone, cased at 104'.....	55	150
Slate	101	251
Sand	69	320
Slate	96	416
Sand	64	480
Slate	70	550
Sand, salt water, 572'.....	225	775
Slate	16	791
Sand	145	936
Slate and shells.....	172	1108
Lime, (Big Lime).....	219	1327
Slate	16	1343
Red rock.....	7	1350
Big Injun sand, gas, show of oil.....	38	1388
Slate to bottom.....	2	1390

This well starts 15 to 20 feet above the Stockton-Lewis-ton coal.

Branchland Coal Company's Well No. 184 (L-481), Sheridan District.

Located on Trace fork of Fourmile creek, one mile west of Branchland; authority, United Fuel Gas Company; elevation, 600' A. T. L.

	Thickness Feet.	Total Feet.
Surface, 10" casing.....	25	25
Sand	43	68
Slate	40	108
Sand	28	136
Slate	24	160
Coal	2	162
Slate	30	192
Slate, shelly.....	73	265
Sand, slate breaks.....	275	540
Slate	10	550
Sand, white, flow salt water, 585'.....	380	930
Slate	10	940

	Feet. Thickness	Feet. Total
Red rock and lime shells.....	59	999
Lime	6	1005
Slate	5	1010
Lime	17	1027
Lime with slate breaks.....	13	1040
Red rock with shells.....	7	1047
Lime	224	1271
Red rock and shells.....	49	1320
Big Injun sand, gas.....	17	1337

This well starts 10 to 15 feet above the Stockton-Lewiston coal.

E. E. Adkins' Well No. 104 (L-485), Sheridan District.

Located on Harless branch of Fourmile creek, 2½ miles west of Branchland; authority, Columbia Gas & Electric Company; elevation, 900' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	376	376
Coal, Stockton-Lewiston.....	4	380
Unrecorded	370	750
Gas sand.....	25	775
Unrecorded	145	920
Salt sand.....	370	1290
Unrecorded	85	1375
Little Lime.....	15	1390
Pencil cave.....	10	1400
Big Lime.....	231	1631
Unrecorded	26	1657
Big Injun sand, gas, 3 million cu. ft., 1657'-1667'	15	1672

This well starts 300 to 310 feet above the Stockton-Lewiston coal, and is near the southwestern edge of the development in the Branchland oil and gas fields.

J. N. Dial's Well No. 76 (L-497), Sheridan District.

Located on Kentuck branch of Fourmile creek, 2¾ miles southwest of Branchland; authority, Columbia Gas & Electric Company; elevation, 958' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	365	365
Coal, Stockton-Lewiston.....	4	369
Unrecorded	381	750
Gas sand	50	800
Unrecorded	95	895

	Thickness Feet.	Total Feet.
Salt sand	365	1260
Unrecorded	125	1385
Little Lime.....	20	1405
Pencil cave.....	4	1409
Unrecorded	2	1411
Big Lime, 1497'-1498', show of oil and gas..	217	1630
Unrecorded	34	1664
Big Injun sand, gas, 3½ million cu. ft.....	25	1689

This well is near the western boundary of the present development in the Branchland oil and gas field.

**Guyandotte Land Association's "Guyan" Well No. 11
(L-502), Sheridan District.**

Located on Fourmile creek, 3 miles southwest of Branchland; authority, Columbia Gas & Electric Company, elevation 946' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	875	875
Salt sand	320	1195
Unrecorded	160	1355
Little Lime.....	15	1370
Pencil cave.....	3	1373
Big Lime, oil, 1477'-1480'.....	107	1480
45-barrel well;		
Little gas at 1458'		

**Guyandotte Land Association's "Guyan" Well No. 10
(L-503), Sheridan District.**

Located on Lick branch of Fourmile creek; authority, Columbia Gas & Electric Company; elevation, 881' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	355	355
Coal	5	360
Unrecorded	450	810
Salt sand.....	325	1135
Unrecorded	175	1310
Big Lime, oil, 1413'-1420'.....	128	1438

Total depth, 1440'; well completed, May 14, 1908.

Hurston Clay's Well No. 4 (L-593), Sheridan District.

Located on Red run of Fourmile creek, 4 miles southwest of Branchland; authority, Fourmile Oil Company; elevation, 950' A. T. B.

	Thickness Feet.	Total Feet.
Unrecorded	1300	1309
Salt sand	9	1309
Unrecorded	99	1408
Little Lime	2	1410
Unrecorded	30	1440
Pencil cave	10	1450
Big Lime , oil, 50 bbls., 1589' - 1594'	144	1594
Total depth, 1617'; well completed Feb. 6, 1909.		

This well starts 160 to 170 feet above the Upper Freeport coal and is on the extreme southwestern edge of the present development in the Branchland oil and gas field.

Carroll District.

Carroll district lies in the northern part of Lincoln, and adjoins Cabell county on the north, Putnam county and Duval district on the east, Union district on the south, and Sheridan district on the west.

Lincoln Land Association's Well No. 1 (L-625), Carroll District.

Located on Trace creek, 2 miles southeast of Hamlin; authority, South Penn Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	31	31
Sand	289	320
Coal, Stockton	4	324
Sand	153	477
Slate	20	497
Sand	323	820
Salt sand	230	1050
Sand and shells	130	1180
Lime and slate	67	1247
Sand	81	1328
Slate	5	1333
Sand	19	1352
Little Lime	25	1377
Slate (Pencil cave)	5	1382
Big Lime	60	1442

	Thickness	Total
	Feet.	Feet.
Big Injun sand	128	1570
Unrecorded	160	1730
Squaw sand	35	1765
Unrecorded	323	2088
Berea Grit, dry	22	2110
Unrecorded	525	2635

This well starts just below the Upper Freeport coal horizon.

Poor Farm Well No. 1 (L-423), Carroll District.

Located on the County Poor farm, one mile and a half northeast of Hamlin; authority, C. O. Nixon; elevation, 650' A. T. B.

	Feet.	Feet
Salt sand, gas, 1,000,000 cu. ft.	715	to 790
Unrecorded	790	to 1200
Big Lime, gas, 25,000 cu. ft.	1200	to 1408
Big Injun sand	1463	to 1527
Berea sand, gas, 250,000 cu. ft.	1973	to 1993

This well starts just below the Upper Freeport coal.

George A. Black's Well No. 1 (L-426), Carroll District.

Located on head of Trace fork, 3 miles south of Hamlin; authority, Mr. Foote; elevation 900' A. T. B.

	Thickness	Total
	Feet.	Feet.
Unrecorded	815	815
Gas sand	90	905
Salt sand	505	1410
Slate	5	1415
Maxton sand	35	1450
Slate	10	1460
Little Lime	10	1470
Pencil cave.....	5	1475
Big Lime, show of gas, 1617'	190	1665
Red rock.....	32	1697
Big Injun sand	42	1739
Slate	111	1850
Lime shelis.....	25	1875
Hard lime.....	45	1920
Slate and shells.....	160	2080
Slate	96	2176
Brown slate.....	20	2196
Berea sand, gas	22	2218

This well starts 140 to 150 feet above the Upper Freeport coal.

A. F. Black's Well No. 1 (L-427), Carroll District.

Located on Mud river, $\frac{1}{4}$ mile southwest of Myra; authority, Mr. Foote; elevation, 750' A. T. B.

	Thickness Feet.	Total Feet.
Red rock.....	10	10
Sand	315	325
Sand and shell.....	325	650
Salt sand.....	425	1075
Salt sand and red rock.....	90	1165
Maxton sand.....	60	1225
Slate	5	1230
Little Lime.....	35	1265
Big Lime, slight gas, 1352'.....	205	1470
Red rock.....	10	1480
Big Injun sand, gas.....	22	1502

This well starts near the top of the Upper Freeport coal. These two wells on the Black farms are at present in a field to themselves, as no other development has been made near them.

Laurel Hill District.

Laurel Hill district lies in the western part of Lincoln and adjoins Wayne county on the west, Sheridan district on the north, Jefferson district on the east, and Harts Creek district on the south.

Guyan Well No. 18 (L-589), Laurel Hill District.

Located on Ten Mile creek, 1 mile and a half northwest of Ranger; authority, Columbia Gas & Electric Company; elevation, 714' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	525	525
Salt sand.....	465	990
Unrecorded	135	1125
Little Lime.....	5	1130
Pencil cave.....	40(?)	1170

	Thickness Feet.	Total Feet.
Big Lime.....	230	1400
Unrecorded	58	1458
Big Injun sand.....	7	1465
Unrecorded	531	1996
Berea sand.....	10	2006

Dry in all sands; this well begins about 35 feet above the Winifrede coal.

Guyandotte Land Association's Well No. 12 (L-585), Laurel Hill District.

Located on Pound fork of Fourmile creek, $3\frac{1}{2}$ miles southwest of Branchland; authority, Columbia Gas & Electric Company; elevation, 764' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	80	80
Coal, (No. 5 Block).....	3	83
Unrecorded	582	665
Salt sand.....	275	940
Unrecorded	205	1145
Big Lime.....	223	1368
Unrecorded	32	1400
Big Injun sand, gas, 1 million feet.....	26	1426

Harts Creek District.

Harts Creek district is situated in the southwestern part of Lincoln and adjoins Wayne county on the west, Laurel Hill and Jefferson districts on the north, Boone county on the east, and Boone and Logan counties on the south.

Guyandotte Land Association's Well No. 102 (L-618), Harts Creek District.

Located on Guyandot river, $\frac{3}{4}$ mile northwest of Harts Station; authority, Columbia Gas & Electric Company; elevation, 643' A. T. L.

	Thickness Feet.	Total Feet.
Unrecorded	50	50
Coal	5	55
Unrecorded	411	466
Sand	39	505
Unrecorded	5	510

	Thickness Feet.	Total Feet.
Salt sand.....	340	850
Unrecorded	250	1100
Little Lime.....	30	1130
Unrecorded	10	1140
Pencil cave.....	10	1150
Unrecorded	4	1154
Big Lime.....	301	1455
Unrecorded	175	1630
Big Injun sand (Squaw).....	50	1680

This well begins at the horizon of the Chilton coal, and was dry in all sands.

Lincoln Land Association's Well No. 4 (L-575), Harts Creek District.

Located on Laurel creek of Big Ugly, one mile and three-quarters northeast of Leet; authority, South Penn Oil Company; elevation, 670' A. T. L.

	Thickness Feet.	Total Feet.
Soil	17	17
Sand	273	290
Coal, Cedar Grove?.....	3	293
Sand, (Upper Winifrede).....	67	360
Coal, No. 2 Gas?.....	4	364
Sand	546	910
Slate and shells.....	80	990
Sand	175	1165
Red rock.....	5	1170
Lime	38	1208
Slate	6	1214
Lime	26	1240
Slate	46	1286
Little Lime.....	46	1332
Pencil cave.....	8	1340
Big Lime.....	100	1440
Sand, (Beckett).....	22	1462
Lime	68	1530
Red rock.....	5	1535
Big Injun sand.....	19	1554
Red rock.....	22	1576
Sand, (Squaw).....	6	1582
Slate and shells.....	51	1633
Slate	22	1655
Lime	107	1762
Slate and shells.....	81	1843
Slate	42	1885
Slate and shells.....	145	2030
Black shale.....	20	2050
Berea sand.....	20	2070
Slate	10	2080
Lime	25	2105
Slate and shells to bottom, dry.....	155	2260

The Big Lime is divided by a sand 22 feet thick, which possibly corresponds to the Beckett. The top of the Berea comes 710 feet below the top of the Big Lime, which is practically the same interval as that found in the Griffithsville oil and gas field.

Lincoln Land Association's Well No. 6 (L-573), Harts Creek District.

Located on Sand creek, one mile and a third north of Ferrellsburg, authority, South Penn Oil Co.; elevation, 725' A. T. B.

	Thickness Feet.	Total Feet.
Soil	20	20
Sand, hard, (Lower Winifrede).....	25	45
Coal, (Chilton).....	2	47
Sand, hard.....	43	90
Slate	115	205
Sand, hard.....	30	235
Coal, Cedar Grove.....	2	237
Slate	8	245
Sand	15	260
Slate, soft.....	52	312
Coal, No. 2 Gas.....	2	314
Slate, black and soft.....	266	580
Lime	20	600
Sand	545	1145
Red rock.....	7	1152
Lime	15	1167
Slate	20	1187
Lime	15	1202
Lime, soft.....	10	1212
Red rock.....	4	1216
Lime	20	1236
Black slate.....	10	1246
Lime	12	1258
Black slate.....	17	1275
Lime	25	1300
Black slate.....	4	1304
Little Lime.....	16	1320
Pencil cave.....	5	1325
Big Lime.....	125	1450
Red rock.....	1	1451
Black lime.....	4	1455
Red rock	85	1540
Slate	105	1645
Lime	20	1665
Slate	20	1685
Lime	75	1760
Slate	244	2004
Brown shale.....	34	2038
Berea sand.....	20	2058
Slate	200	2258
Sand, hard.....	20	2278
Slate to bottom, dry.....	340	2618

Mauch
Chunk,
180'

This well begins about 5 to 10 feet above the Winifrede coal horizon. The Mauch Chunk Red shale shows a southward increase and the Big Injun appears to be absent entirely at this point. The top of the Berea comes 713 feet below the top of the Big Lime.

WAYNE COUNTY WELL RECORDS.

Wayne county lies west of Lincoln and Cabell, and is the most western county of the State. The Parkersburg syncline passes through it north of the center, and the great Warfield anticline crosses its southern boundary. The rocks in the northern portion are generally flat, rising gradually toward the Ohio river, and the rocks south of the Parkersburg syncline rise more rapidly to the south.

Some large gas wells have been found in the southern part of the county and there are both oil and gas possibilities throughout a large area of the southern part of the county.

The accompanying table of wells contains the abbreviated logs of 63 borings as well as the tidal elevations of the well mouth of 29 other wells of which no records were obtained. These wells are numbered from 0 to 63, and are grouped by magisterial districts, the serial number in each instance corresponding to the number of the same well on the Economic geology map accompanying this report in a separate cover. (See explanation preceding the table of Cabell county wells on page 289.

Summarized Record

No. on Map.	Name of Well.	District.	Owner	Elevation	SALT SAND	
					Depth (top)	Thick- ness
1	Guyandot Land Assn.	Grant	Hamlin Oil Co.	1134LC	1075	225
2	Meredith Dyre	Grant	Guyan Oil Co.	797	720	95
3	Guyandot Land Assn.	Grant	Hamlin Oil Co.	760LC	640	270
4	Guyandot Land Assn.	Grant	Hamlin Oil Co.	1160LC	1160	185
5	Guyandot Land Assn.	Grant	Hamlin Oil Co.	695LC	470	375
6	Guyandot Land Assn.	Grant	Guyan Oil Co.	659LC	.....	.....
7	Guyandot Land Assn.	Lincoln	Hamlin Oil Co.	780	.....	.....
8	Guyandot Land Assn.	Lincoln	Hamlin Oil Co.	759LC	.....	.....
9	Guyandot Land Assn.	Lincoln	Hamlin Oil Co.	715	1075	225
10	Sands & Miller	Lincoln	.....	690	.....	.....
11	Sands & Miller	Lincoln	.....	720	.....	.....
12	Guyandot Land Assn.	Lincoln	Guyan Oil Co.	699LC	.....	.....
13	Thomas Stepp Hrs. No. 3	Lincoln	Meteor Carbon Co.	645	.....	.....
14	Thomas Stepp Hrs. No. 1	Lincoln	Meteor Carbon Co.	614L	.....	.....
15	Thomas Stepp Hrs. No. 2	Lincoln	Meteor Carbon Co.	700	.....	.....
16	Sam'l Crumm	Lincoln	.....	585	.....	.....
17	J. L. Stettinus	Lincoln	.....	605	.....	.....
18	Glenhayes Co. No. 2	Lincoln	South Penn Oil Co.	620	.....	.....
19	Glenhayes Co. No. 1	Lincoln	South Penn Oil Co.	635	475	89
20	L. K. Vinson	Lincoln	Tug River G. & O. Co.	605	.....	.....
21	Guyandot Land Assn.	Lincoln	.....	.....	.....	.....
22	Felix Wilson	Lincoln	Bethel & Sears	590	.....	.....
23	Caldwell Colton	Lincoln	Marrowbone O. & G. Co.	685	585	55
24	A. W. Wilson	Lincoln	.....	721L	.....	.....
25	A. W. Wilson	Lincoln	.....	721L	.....	.....
26	A. W. Wilson	Lincoln	.....	750	.....	.....
27	P. W. Nelson No. 3	Stonewall	Belvard O. & G. Co.	780	.....	.....
28	Birt Bing No. 1	Stonewall	Belvard O. & G. Co.	685	.....	.....
29	East Lynn Coal Co.	Stonewall	E. Lynn Coal Co.	615	.....	.....
30	Millard Adkins	Stonewall	Hamlin Oil Co.	725L	642	45
31	J. H. Crockett	Stonewall	Belvard O. & G. Co.	880	.....	.....
32	Commodore Fraley	Stonewall	Cent. Wayne O. & G. Co.	810	.....	.....
33	Lucian Adkins No. 5	Stonewall	Belvard O. & G. Co.	555	.....	.....
34	Chapman Adkins No. 4	Stonewall	Belvard O. & G. Co.	660	.....	.....
35	Wm. Russell No. 6	Stonewall	Belvard O. & G. Co.	660	.....	.....
36	East Lynn Coal Co.	Stonewall	East Lynn Coal Co.	627	.....	.....
37	East Lynn Coal Co.	Stonewall	East Lynn Coal Co.	620	.....	.....
38	East Lynn Coal Co.	Stonewall	B. J. Prichard et al.	607	525	405
39	Lee N. Sanson No. 9	Stonewall	Belvard O. & G. Co.	621	.....	.....
40	Bertha Wooten No. 2	Stonewall	Belvard O. & G. Co.	709LB	.....	.....
41	M. J. Mills	Stonewall	Cent. Wayne O. & G. Co.	610	.....	.....
42	Z. A. Skeen	Stonewall	Wayne Oil Co.	739LC	625	355
43	Z. A. Skeen	Stonewall	Guyan Oil Co.	765	565	195
44	Frank Frasher	Stonewall	Guyan Oil Co.	690LC	760	225
45	G. A. Ramey	Stonewall	Hamlin Oil Co.	740	610	450
46	Guyandot Land Assn. No. 136	Stonewall	Columbia G. & E. Co.	703LC	630	375
47	Guyandot Land Assn.	Stonewall	Hamlin Oil Co.	790	735	305
48	Scott Adkins	Stonewall	Guyan Oil Co.	680L	650	190
49	A. W. Preston	Union	Wayne Oil Co.	736	1055	140
50	Jack Spears	Butler	Bethel & Sears	560	.....	.....
51	Meyers Heirs	Butler	Meyers Heirs	520	.....	.....
52	A. W. Wilson	Lincoln	.....	750	.....	.....
53	Jas. Hutchinson	Ceredo	.....	585	.....	.....
54	Kcnova Land Co.	Ceredo	Kenova Land Co.	575L	.....	.....
55	Kcnova Land Co.	Ceredo	Kenova Land Co.	575L	.....	.....
56	Guyandot Land Assn.	Stonewall	Wayne Oil Co.	.....	705	180
57	B. J. Prichard No. 10	Union	Belvard O. & G. Co.	.....	.....	.....
58	Collins No. 78	Grant	Columbia G. & E. Co.	890	740	450
59	B. J. Prichard	Union	Belvard O. & G. Co.	.....	.....	.....
60	Robt. Prichard No. 8	Boyd Co., Ky.	Wm. Freidenberger	560	.....	.....
61	B. J. Prichard	Union	Cent. Wayne O. & G. Co.	678L	.....	.....
62	M. F. Dyre	Grant	Wayne Oil Co.	820	610	450
63	Guyandot Land Assn.	Grant	Hamlin Oil Co.	854LC	625	355

Wells in Wayne County

BIG LIME.		BIG INJUN SAND		BEREA SAND.		Total Depth.	Producing Sand	No. on Map.
Depth (top)	Thick-ness	Depth (top)	Thick-ness	Depth (top)	Thick-ness			
1420	205	1643	20	.....	.....	1936	Big Lime, gas, 3½ mil., 890-900.....	1
1232	215	1480	27	.....	.....	1507	Big Injun, gas, 1 mil. at 150' in.....	2
1096	155	1304	45	.....	.....	1354	Big Injun, gas, 1 mil., 1312-16.....	3
1425	257	1682	38	.....	.....	1767	Big Lime, gas, 2 mil.; gas in Gas sand.....	4
1000	200	1220	15	1768	15	2005	1-5 mil. gas, Big Inj.; show oil and gas, Salt sand	5
1000	190	1218	27	1789	25	2300	Big Injun, small gas and oil.....	6
.....	.....	.....	.....	.....	.....	.....	.....	7
946	312	1303	27	.....	.....	1330	Big Injun, gas; small oil in Big Lime.....	8
1420	205	1643	20	.....	.....	1663	Big Lime.....	9
.....	.....	.....	.....	.....	.....	.....	.....	10
.....	.....	.....	.....	.....	.....	.....	Gas; show of oil, 1132-48.....	11
1000	30	1276	12	.....	.....	1722	Big Injun.....	12
.....	.....	1280	105	.....	.....	1400	.....	13
.....	.....	.....	.....	.....	.....	1607	.....	14
.....	.....	.....	.....	.....	.....	.....	.....	15
.....	.....	.....	.....	.....	.....	.....	.....	16
885	200	.....	.....	1637	25	1965	.....	17
910	198	.....	.....	1657	28	2150	.....	18
.....	.....	.....	.....	.....	.....	.....	.....	19
.....	.....	.....	.....	.....	.....	.....	.....	20
.....	.....	.....	.....	.....	.....	.....	.....	21
.....	.....	.....	.....	.....	.....	.....	.....	22
1074	240	.....	.....	1850	10	1875	.....	23
.....	.....	.....	.....	1961	7	1968	.....	24
.....	.....	.....	.....	.....	.....	.....	.....	25
.....	.....	.....	.....	.....	.....	.....	.....	26
.....	.....	.....	.....	.....	.....	.....	.....	27
.....	.....	.....	.....	.....	.....	62'8"	.....	28
1153	210	1408	32	.....	.....	1440	Big Injun, gas, ½ mil., pay, 16'	29
.....	.....	.....	.....	.....	.....	.....	.....	30
.....	.....	.....	.....	.....	.....	.....	.....	31
.....	.....	.....	.....	.....	.....	.....	.....	32
.....	.....	.....	.....	.....	.....	.....	.....	33
.....	.....	.....	.....	.....	.....	.....	.....	34
.....	.....	.....	.....	.....	.....	.....	.....	35
.....	.....	.....	.....	.....	.....	172'3"	.....	36
.....	.....	.....	.....	.....	.....	148	.....	37
1140	100	1270	40	1824	10	1850	Dry hole	38
.....	.....	.....	.....	.....	.....	.....	.....	39
.....	.....	.....	.....	.....	.....	.....	.....	40
.....	.....	.....	.....	.....	.....	.....	.....	41
1159	192	1370	46	1935	18	1953	Big Injun, gas, 4 mil.....	42
1125	185	1331	40	.....	.....	1383	Big Injun, gas, ½ mil.; pay 1342; show oil in B. Lm.....	43
1126	184	1344	30	1910	15	1935	.....	44
1205	139	1385	41	.....	.....	1428	Big Injun, gas, ¾ mil.; pay 1413-16.....	45
1150	189	1361	42	.....	.....	1403	Big Injun, gas, 1 mil.; pay 1365-86.....	46
1250	160	1447	29	.....	.....	1476	Big Injun, gas, 1 mil.; pay 1447-76.....	47
1161	176	1415	30	1960	12	2004	Dry hole.....	48
1440	200	1690	50	.....	.....	1799	.....	49
.....	.....	.....	.....	.....	.....	.....	.....	50
.....	.....	.....	.....	.....	.....	192	.....	51
.....	.....	.....	.....	2080	25	2250	.....	52
.....	.....	.....	.....	.....	.....	.....	.....	53
.....	.....	.....	.....	.....	.....	.....	.....	54
.....	.....	.....	.....	.....	.....	.....	.....	55
1234	188	1456	41	.....	.....	1497	Big Injun, gas, ¾ mil.....	56
.....	.....	.....	.....	.....	.....	.....	.....	57
1450	230	.....	.....	.....	.....	1782	Dry hole; small show of oil.....	58
.....	.....	.....	.....	.....	.....	.....	.....	59
1180	50	1295	130	1885	40	2880	.....	60
.....	.....	.....	.....	.....	.....	.....	.....	61
1205	139	1385	41	.....	.....	1428	Big Injun, gas, 2 mil.....	62
1159	192	1370	46	1933	18	1953	Berea, gas, 4 mil.....	63

Although the accompanying table of wells contains quite a fund of information as to the different oil and gas horizons; viz., the Salt sand, Big Lime, Big Injun and Berea sands, however, it is quite necessary to publish the complete logs of a number of these wells, as has been done for Cabell and Lincoln counties, not only to preserve the records from loss, but for the great amount of information they contain in regard to other oil and gas bearing rocks and the presence or absence of the commercial coal beds. The accurate location of any well is readily determined by its serial number published in the table and in the heading of the complete well record, and also on the Economic geology map accompanying the report. Gas has been found in paying quantities in different parts of the county, but thus far no oil pool of commercial value has been discovered in the county.

Ceredo District.

Ceredo district occupies the northern portion of Wayne, bordering the Ohio river on the north and the Big Sandy on the west. Three wells have been drilled in this district, two by the Kenova Land Company just south of the Norfolk & Western station. These wells were reported to be light gassers in the Big Injun sand, and the gas was used for fuel for a time, but the wells are now abandoned. The writer was not able to secure a record of either.

Another well was drilled on the land of James Hutchinson on Mill creek, 2 miles south of Kenova. This well was abandoned as a dry hole, and its record could not be obtained.

Butler District.

Butler district lies south of Ceredo district and borders Big Sandy river on the west. No test holes for oil and gas have yet been put down in this district. A deep well was recently drilled near Burgess, Kentucky, just west of Lett, W. Va., on the Robert Prichard farm, and the following interesting record of this well was obtained:

Robert Prichard's Well No. 1 (W-60), Boyd County, Ky.

Authority, Wm. Friedenberger; elevation, 560' A. T. B.

	Thickness Feet.	Total Feet.
Blue mud.....	38	38
Gravel	5	43
Blue mud.....	20	63
Slate	25	88
Sand	20	108
Slate	10	118
Sand	50	168
Slate with a few sandy shells.....	174	342
Coal, Stockton?.....	3	345
Slate	27	372
Sand and lime.....	68	440
Sand	45	485
Slate	35	520
Sand	55	575
Slate	5	580
Brown and dark slate and shells.....	165	745
Sand	20	765
Black slate and shells.....	79	844
Salt sand, gas.....	104	948
Slate	30	978
Sand, water.....	90	1068
Black slate and lime.....	112	1180
Big Lime.....	50	1230
Lime	8	1238
Sand and slate.....	57	1295
Sand and slate.....	130	1425
Dark slate.....	440	1865
Black slate.....	20	1885
Berea sand.....	40	1925
Sandy shells and slate.....	40	1965
Dark slate.....	482	2447
Dark slate and black lime.....	161	2608
White slate.....	128	2736
Brown slate.....	49	2785
"Raglan" sand to bottom, dry.....	95	2880

A core drill hole (W-51) was put down by Meyers' Heirs just south of Hubbardstown on the Big Sandy river to test for coal. The record of this hole is included in the Hubbards-town section, page 77, of this volume. Another core drill test hole was put down on Mill creek, southeast of Fort Gay on the property of Jack Speens, but its record was not obtained.

Union District.

Union district lies south of Ceredo and east of Butler district. Several wells have been drilled for oil and gas in this

district. The A. W. Preston (W-49), drilled by the Wayne Oil Company of Huntington, W. Va., on Reuben branch of Beech fork, is one of these, the record of which has already been published in the Reuben branch section on page 110, of this volume.

The Central Wayne Oil & Gas Company drilled a well at Wayne which is furnishing gas for the town of Wayne. This gas is from the Berea sand.

Stonewall District.

Stonewall district is situated south of Union and east of Butler. Considerable prospecting has been done for oil and gas in this district and there are several wells producing gas of commercial value, but thus far no oil well of value has been discovered.

The East Lynn Coal Company of East Lynn, W. Va., put down three core drill holes on their property at East Lynn to test for the coals underneath the surface. The record of these core drill holes has been kindly furnished the writer by Captain William Perry, of said Company.

East Lynn Core Drill Hole No. 1 (W-29), Stonewall District.

Located at East Lynn; elevation, 615' A. T. B.

	Thickness		Total	
	Ft.	In.	Ft.	In.
Surface	10	7	10	7
Sand rock.....15' 6"	Homewood	43	53	7
Sandy slate..... 3 6				
Sandrock .....24 0				
Coal, (Stockton-Lewiston).....	1	3	54	10
Sand rock.....	7	10	62	8

The top of this core drill begins about 25 feet below the No. 5 Block coal (East Lynn seam), so that the coal encountered at 53' 7" is the Stockton-Lewiston bed.

The record of core drill hole No. 2 (W-36), located on East Lynn creek at the mouth of Peter Cave creek, has been given in the East Lynn section on page 143, of this volume.

East Lynn Core Drill Hole No. 3 (W-37), Stonewall District.

Located on the East fork of Twelvepole, near the mouth of Big Lynn creek; elevation, 630' A. T. B.; authority, Capt. William Perry, of East Lynn.

	Thickness		Total	
	Ft.	In.	Ft.	In.
Surface	9	8	9	8
Sand rock.....24 0 } Homewood	46	10	56	6
Slate, sandy.....13 0 }				
Sand rock mixed with coal.....	6	0	62	6
Sandy slate.....	10	2	72	8
Sand rock.....	18	0	90	8
Slate	6	4	97	0
Coal mixed with slate.....	0	8	97	8
Slate	4	6	102	2
Sand rock.....	25	6	127	8
Bone coal.....	1	0	128	8
Coal	0	5	129	1
Black slate.....	1	6	130	7
Sandy fire clay.....	2	9	133	4
Sandy slate.....	6	8	140	0
Bone coal.....0' 6"				
Coal .....2 2 }				
Bone coal.....0 5 }				
Parting .....0 7 }				
Good bone coal.0 7 }				
Coal .....1 3 }				
Fire clay to bottom.....	2	6	148	0

The above core drill hole begins about 25 feet below the No. 5 Block coal (East Lynn seam), and the coal encountered at 140 feet would therefore be the Coalburg bed. The Stockton-Lewiston seam appears to be almost completely absent.

A test well for oil and gas was put down at East Lynn by B. J. Prichard, et al, of which the following is the record:

East Lynn Well No. 1 (Prichard) (W-38), Stonewall District.

Located at East Lynn; authority, B. J. Prichard; elevation, 607' A. T. B.

	Thickness	Total
	Feet.	Feet.
Conductor	16	16
Gravel	20	36
Sand shell.....	2	38
Soft coal, Stockton-Lewiston.....	6	44
Slate	92	136
Coal, Coalburg.....	11	147
Slate	33	180
Sand, water, and gas at bottom.....	15	195
Slate	51	246

	Thickness Feet.	Total Feet.	
Sand	15	261	
Slate	49	310	
Lime shells.....	10	320	
Slate	18	438	
Sand	36	474	
Slate	51	525	
White lime.....	75	600	
Salt sand.....	330	930	
Red rock.....	5	935	} Mauch Chunk, 100'
Gray lime.....	25	960	
"Bottom" lime.....	20	980	
Black slate.....	20	1000	
Red rock.....	10	1010	
White slate.....	20	1030	
Big Lime	210	1240	
Red rock.....	20	1260	
Black slate.....	10	1270	
Big Injun sand	40	1316	
Black slate.....	70	1380	
Slate and shells.....	40	1420	
White slate.....	230	1650	
Lime shell.....	10	1660	
White slate.....	146	1806	
Black shale.....	18	1824	
Berea sand	10	1834	
Green slate.....	16	1850	

Good showing of oil in Big Lime at 1,120 feet. Good showing of oil and gas in Big Injun. Show of both oil and gas in Berea.

The following is a partial record of the Z. A. Skeen well, located on Laurel creek of East fork of Twelvepole, southeast 3 miles and a half from East Lynn and drilled by the Wayne Oil Company:

Z. A. Skeen's Well No. 1 (W-42), Stonewall District.

Elevation, 739' A. T. L.; authority, Wayne Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	140	140
Coal, (Coalburg?)	5	145
Unrecorded	420	565
Salt sand	195	760
Unrecorded	340	1100
Little Lime	20	1120
Pencil cave.....	5	1125
Big Lime	185	1310
Unrecorded.....	21	1331
Big Injun sand	40	1371
Unrecorded to bottom.....	12	1383

Show of oil. 1275' - 1285'; gas, $\frac{1}{2}$ million cu. ft., 1242' - 1244'

The following is the record of well No. 25, Guyandotte Land Association. Drilled on the land of G. A. Raney, located on Lick creek of East fork of Twelvepole, 5 miles southeast from East Lynn:

G. A. Raney's Well (W-45), Stonewall District.

Elevation, 739' A. T. L.

	Thickness	Total
	Feet.	Feet.
Unrecorded	610	610
Salt sand	450	1060
Unrecorded	95	1155
Little Lime	13	1168
Unrecorded	20	1188
Pencil cave.....	7	1195
Unrecorded	10	1205
Big Lime , gas, 1310'.....	139	1344
Unrecorded	41	1385
Big Injun sand , gas, 1403'-1405' and 1413'-1416'	41	1426
Total depth.....		1428
Gas, estimated 750,000 cubic feet in Big Injun sand.		

Guyan Well No. 33 (W-43), Stonewall District.

Located on Lick creek of East fork of Twelvepole, 5 miles southeast of East Lynn; elevation, 768' A. T. L.

	Thickness	Total
	Feet.	Feet.
Unrecorded	640	640
Salt sand	405	1045
Unrecorded	40	1085
Little Lime	5	1090
Unrecorded	55	1145
Big Lime	228	1373
Unrecorded	32	1405
Big Injun sand , gas, 1412'-1430'.....	31	1436
Gas in Big Injun, estimated at 8,000,000 cu. ft.		

Another well was drilled on Lick creek by the Hamlin Oil Company on land of T. F. Frazier.

T. F. Frazier's Well (W-44), Stonewall District.

Located on Lick creek near fork of stream; elevation, 690' A. T. L.; authority, Wayne Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	50	50
Coal	4	54
Unrecorded	543	597
Sand	130	727
Unrecorded	33	760
Salt sand.....	225	985
Unrecorded	102	1087
Little Lime.....	22	1119
Pencil cave.....	7	1126
Big Lime.....	184	1310
Unrecorded	34	1344
Big Injun sand.....	32	1376
Unrecorded	534	1910
Berea sand.....	15	1925
Slate to bottom.....	10	1935
Total depth, 1935 feet; dry hole.		

The top of the Berea is here 784 feet below the top of the Big Lime.

The Hamlin Oil Company, of Huntington, W. Va., drilled the Guyan well No. 35, located on the land of John Davis, along the Right fork of Beech fork of Twelvepole, one-half mile southwest of Gilkerson.

John Davis' Well No. 1 (W-47), Stonewall district.

Elevation, 787' A. T. L.; authority, Hamlin Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	25	25
Coal, (Upper Freeport).....	5	30
Unrecorded	280	310
Coal, (Stockton-Lewiston).....	5	315
Unrecorded	390	705
Sand	20	725
Unrecorded	10	735
Salt sand.....	305	1040
Unrecorded	142	1182
Little Lime.....	8	1190
Pencil cave.....	10	1200
Unrecorded	50	1250
Big Lime.....	160	1410
Unrecorded	37	1447
Big Injun sand, gas, 1 million feet.....	29	1476

The Guyan well No. 21 is located on Beech fork of Twelvepole, on land of Scott Adkins, drilled by the Guyan Oil Company.

Scott Adkins' Well No. 1, Stonewall District.

Elevation, 680' A. T. L.; authority, Guyan Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	650	650
Salt sand	190	840
Unrecorded	321	1161
Big Lime	176	1337
Unrecorded	68	1415
Big Injun sand	30	1445
Unrecorded	515	1960
Berea sand	12	1972
Unrecorded to bottom.....	32	2004

Dry hole; well completed, July 31, 1909.

Grant District.

Grant district lies south of Stonewall and adjoins Lincoln district on the west. Some prospecting for oil and gas has been done in this district. Gas has been found of economic value, but thus far no oil in paying quantities has been discovered.

The Hamlin Oil Company drilled the Guyan well No. 6 on the divide between the waters of Sycamore fork of West fork of Twelvepole and the waters of Rich creek of East fork of Twelvepole, two miles and a half northwest from Dunlow.

Guyan Well No. 6 (W-1), Grant District.

Elevation, 1134' A. T. L.; authority, Hamlin Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	890	890
Salt sand, gas 890'-900'	410	1300
Unrecorded	67	1367
Little Lime	18	1385
Unrecorded	17	1402
Pencil cave.....	18	1420
Big Lime, gas, 3½ million cu. ft., 1495'-1515'	205	1625
Unrecorded	18	1643
Big Injun	20	1643
Unrecorded to bottom.....	293	1936

Another well put down by the Hamlin Oil Company of Huntington, is located on Rich creek, 3 miles and a half northeast from Dunlow on the property of the Guyandotte Land Association, produces gas from the Big Injun sand.

Guyandotte Land Association's Well No. 24 (W-3), Grant District.

Located on Rich creek; elevation, 760' A. T. L.; authority, Hamlin Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	510	510
Sand	120	630
Unrecorded	10	640
Salt sand.....	270	910
Unrecorded	165	1075
Little Lime.....	10	1085
Unrecorded	11	1096
Big Lime.....	155	1251
Unrecorded	53	1304
Big Injun sand, gas, 1 million cu. ft., 1312'-1316'	45	1349
Unrecorded to bottom.....	5	1354
"Well completed October 10, 1909."		

The Hamlin Oil Company drilled a well on the divide between Rich creek and Sycamore creek, two miles and three-quarters northeast from Dunlow on the property of the Guyandotte Land Association, and the following is a partial record of same.

Guyandotte Land Association's Well No. 8 (W-4), Grant District.

Elevation, 1160' A. T. L.; authority, Hamlin Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	426	426
Coal, (Coalburg).....	4	430
Unrecorded	470	900
Sand, slight gas, 905' - 917'.....	255	1155
Unrecorded	5	1160
Salt sand.....	185	1360
Little Lime.....	8	1368
Unrecorded	39	1407
Pencil cave.....	18	1425
Big Lime, gas, 2 million cu. ft., 1523'-1530'.	257	1682
Big Injun sand.....	38	1720
Unrecorded to bottom.....	47	1767
"Well completed May 25, 1909."		

The following is a partial record of the Guyan well No.

4 (W-6) located at the mouth of Cove creek on East fork of Twelvepole at Kiahville on the property of the Guyandotte Land Association, and drilled by the Guyan Oil Company of Huntington, W. Va:

Guyan Well No. 4 (W-6), Grant District.

Located at Kiahville; elevation, 659' A. T. L.; authority, Guyan Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	275	275
Coal, No. 2 Gas.	3	278
Unrecorded	83	381
Sand	16	377
Unrecorded	549	926
Sand, Maxton?	74	1000
Big Lime.	190	1190
Unrecorded	28	1218
Big Injun, show of oil and gas.	27	1245
Unrecorded	544	1789
Berea sand.	25	1814
Unrecorded to bottom.....	486	2300

"Well completed February 8, 1907."

The record of the well at Dunlow on West fork of Twelvepole is included in the Dunlow section on page 72 of this volume.

Lincoln District.

Lincoln district is situated west of Grant and in the southern part of Wayne, adjoining Mingo county on the south and Kentucky on the west. The southern part of Wayne county lies just north of the Warfield anticline.

The following is a partial record of the Guyandotte well No. 1, located on the Right Hand fork of Sycamore creek, 2 miles northeast of Dunlow, drilled by the Hamlin Oil Company:

Guyandot Well No. 1 (W-8), Lincoln District.

Elevation, 759' A. T. L.; authority, Hamlin Oil Company.

	Thickness Feet.	Total Feet.
Unrecorded	946	946
Big Lime, show of oil and gas, 1010'-1095'. ..	312	1258
Unrecorded	45	1303
Big Injun sand, gas, 1320'-1330'	27	1330

The following is the record of the Stepp Well No. 2, located one mile south of Stone Coal on Tug fork near the southern boundary of the district, and drilled by the Meteor Carbon Company of Stone Coal, W. Va.:

Thomas Stepp's Well No. 2 (W-15), Lincoln District.

Elevation, 700' A. T. B.; authority, Meteor Carbon Company.

	Thickness Feet.	Total Feet.
Clay, yellow.....	15	15
White sand.....	50	65
Coal, (No. 2 Gas—Warfield).....	5	70
White slate.....	45	115
White sand.....	60	175
Black slate.....	75	250
White lime.....	10	260
Black slate.....	80	340
White sand, show of oil, 345'.....	80	420
Black slate.....	105	525
White sand.....	215	740
Black slate and shells.....	50	790
White sand.....	50	840
White slate.....	45	885
White sand, gas, 900'.....	22	907
Black slate.....	13	920
Coal.....	6	926
White slate.....	34	960
Red rock.....	30	990
White slate.....	30	1020
Red rock.....	60	1080
White slate.....	20	1100
Red rock.....	20	1120
White slate.....	20	1140
Red rock.....	10	1150
White slate.....	5	1155
Little Lime.....	30	1185
Black slate.....	5	1190
Big Lime, gas.....	195	1385
Big Injun sand.....	100	1485
Black slate to bottom.....	202	1687

The coal encountered at 65 feet is possibly the No. 2 Gas (Warfield) coal and the bed reported at 920 feet would be at the very base of the Pottsville. It is probably only black slate with streaks of coal.

The following is the record of the Glenhayes well No. 2, drilled by the South Penn Oil Company on property of the Glenhayes Company:

Glenhayes Well No. 2 (W-18), Lincoln District.

Located one-quarter mile northeast of Glenhayes; elevation, 620' A. T. B.; authority, Mr. C. C. McKubin:

	Thickness Feet.	Total Feet.
Surface	16	16
Clay	24	40
Quicksand	10	50
Sand	20	70
Slate	10	80
Sand	15	95
Slate	40	135
Sand	15	150
Slate	10	160
Sand	25	185
Slate	15	200
Sand	6	206
Coal, (No. 2 Gas?)	2	208
Slate	6	214
Slate and shells	236	450
Sand	398	848
Slate	17	865
Maxton sand	10	875
Lime and shells	10	885
Big Lime, show of gas	200	1085
Slate and shells	40	1125
Sand	30	1155
Slate and shells	482	1637
Berea Grit	25	1662
Slate	88	1750
Black shells	75	1825
Slate and shells to bottom, dry... ..	140	1965

The following is the record of the Caldwell-Colton well No. 1 located on Stone Coal creek, near the Wayne-Mingo line, and drilled by the Marrow Bone Oil & Gas Company:

Caldwell-Colton Well No. 1 (W-23), Lincoln District.

Elevation, 685' A. T. B.

	Thickness Feet.	Total Feet.
Mud	5	5
Quicksand	34	39
Sand	11	50
Coal, Cedar Grove	3	53
Sand	47	100
Slate	50	150
Coal, (No. 2 Gas)	6	156

	Thickness Feet.	Total Feet.
Sand	44	200
Slate	50	250
Sand	65	315
Slate	85	400
Sand	50	450
Slate	50	500
Sand	60	560
Lime, hard.....	25	585
Salt sand.....	55	640
Slate	3	643
Sand	17	660
Slate	5	665
Sand	110	775
Slate	25	890
Sand	160	960
Rock, pink.....	10	970
Lime, black.....	10	980
Red rock.....	30	1010
Slate	35	1045
Lime, black.....	10	1055
Maxton sand.....	19	1074
Big Lime, slight gas, 1276'.....	240	1314
Sand, red, broken.....	12	1326
Sand, gray, broken.....	91	1417
Slate, black.....	433	1850
Berea Grit sand.....	10	1860
Unrecorded	15½	1875½

One screw of Berea Grit, fair sand; balance very hard and dark gray in color.

The following is a record of the A. W. Wilson well, drilled at the mouth of Arkansas branch of West fork of Twelve-pole, near the eastern part of the district:

A. W. Wilson's Well No. 1 (W-24), Lincoln District.

Elevation, 721' A. T. L.

	Thickness Feet.	Total Feet.
Soil	34	34
Slate	41	75
Coal	4	79
Slate and rock.....	327	406
Coal, No. 2 Gas.....	6	412
Slate and sandstone.....	264	676
Sandstone	280	956
Slate	86	1042
Sand	87	1129
Slate	5	1134
Sand	42	1176

	Thickness Feet.	Total Feet.
Slate	40	1216
Big Lime	210	1426
Slate	180	1606
Red rock.....	60	1666
Slate	250	1916
Lime	15	1931
Slate	30	1961
Sand, (Berea), dry	7	1968

Dry hole, well abandoned.

The Big Injun sand appears to be absent, and the top of the Berea comes 745 feet below the top of the Big Lime. The coal at 75 feet may be either the **Winifrede** or **Coalburg**, while that at 406' would then represent the **No. 2 Gas bed**.

EFFECT OF GEOLOGICAL STRUCTURE IN OIL AND GAS DISTRIBUTION.

It is a generally accepted theory that geologic structure plays the most important part in the accumulation of oil and gas into pools. By an examination of the structural map accompanying this report, the average citizen may determine with some degree of accuracy the best location for prospective oil and gas fields. Remembering at all times that the measures in this area are thickening rapidly to the southeast from the trough of the great Appalachian syncline which passes through the northwestern corner of the area, also that gas is generally found in or near the crest of an anticline, while oil may be found anywhere along the slope of a corresponding syncline, even to the lowest point in the syncline where salt water is absent. The accompanying map showing the location of all the dry holes, oil and gas wells in this area, together with a fairly accurate structural map of same, will greatly aid the oil and gas operators in locating new oil and gas fields.

PROSPECTIVE OIL AND GAS TERRITORY.

In the discussion of the various oil and gas fields by magisterial districts, the writer has endeavored to outline territory in which the structural conditions were most favorable

for the drilling of test wells for that particular region. It is much easier for geologists to select possible gas territory than it is for oil, for the reason that the former is generally confined to an area along the crest of an anticlinal fold, while the oil belt may occur most anywhere down the slope of the arch, even to the axis of the corresponding syncline. The latter feature is well illustrated by the Tariff oil pool. However, the oil and gas operators will be greatly aided in their search for these valuable hydrocarbons by the accurate map of the three counties accompanying this report, showing the oil and gas wells and dry holes, as well as a fairly accurate structure map exhibiting approximately the amount and direction of the dip of the rocks at all points of the area.

CHAPTER XI.

THE COAL RESOURCES OF THE CABELL-WAYNE-LINCOLN AREA.

The geology, structure and general character of all the coals of the Cabell-Wayne-Lincoln area have already been described in detail in the preceding pages of this volume, and the purposes of this chapter are to consider the coal production, the chemical composition, and the character of the workable coal beds more in detail, as well as the available coal area still unmined.

STATISTICS OF COAL PRODUCTION.

In the area embracing Cabell, Wayne and Lincoln counties, the mining of coal on a commercial scale has been largely confined to the Kanawha series. In Cabell county these coals lie buried below drainage, if present at all and the Pittsburgh bed is found in the hills as has already been told in the preceding pages. There is no mine shipping coal on a commercial basis either by rail or water in Cabell county. The only coal mined in this county is from small openings for local use, located in different parts of the county where coal is supplied from the Pittsburgh bed to the farmers and is hauled away in wagons. In Lincoln county the Stockton-Lewiston coal is mined along the Guyandot river and shipped by the Guyan Branch of the Chesapeake & Ohio Railroad.

In Wayne county the No. 5 Block, the Stockton-Lewis-

ton, the Coalburg, and Winifrede coal beds have been mined on a commercial basis.

The following tables have been compiled from the annual report of the Department of Mines of West Virginia for the year ending June 30, 1911, as given by Hon. John Laing, Chief of Department:

Table Showing the Coal Production of Lincoln and Wayne Counties from 1888 to 1911, inclusive.

Year	LINCOLN COUNTY		WAYNE COUNTY	
	Tons of 2240 lbs.	Tons of 2000 lbs.	Tons of 2240 lbs.	Tons of 2000 lbs.
1892	.....	.....	55,920	62,630
1893	.....	.....	21,839	24,460
1894	.....	.....	40,720	45,606
1895	.....	.....	21,101	23,633
1896	.....	.....	2,000	2,240
1897	.....	.....	.....	.....
1898	.....	.....	.....	.....
1899	.....	.....	.....	.....
1900	.....	.....	.....	.....
1901	.....	.....	.....	.....
1902	12,053	13,499	.....	.....
1903	53,330	59,730	.....	.....
1904	31,744	35,553	.....	.....
1905	7,695	8,618	21,165	23,705
1906	15,801	17,697	14,914	16,704
1907	17,589	19,700	25,217	28,243
1908	25,064	28,071	35,756	40,047
1909	49,954	55,948	34,619	38,773
1910	49,237	55,145	41,464	46,440
1911	64,020	71,702	29,576	33,125
Totals	326,487	365,663	344,291	385,606

The same report gives the following table showing the relative rank of Lincoln and Wayne counties in coal production compared with the other counties of the State:

Order in the Production of Coal, 1897-1911.

Counties.	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
Fayette	1	1	1	1	1	1	2	1	2	2	2	2	2	2	2
McDowell	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1
Marion	3	3	3	3	3	3	3	4	3	4	4	4	4	4	4
Kanawha	4	4	4	4	4	4	5	3	4	3	3	3	3	3	3
Mercer	5	5	5	6	6	6	6	6	6	6	6	6	6	7	8
Harrison	9	9	8	7	5	5	4	5	5	5	5	5	5	5	5
Tucker	6	6	7	5	7	7	7	8	8	8	10	10	10	10	10
Mingo	8	8	9	9	9	8	8	7	7	7	7	7	9	9	9
Mineral	7	7	6	8	8	9	11	11	12	13	14	13	11	13	15
Preston	13	11	10	10	10	10	9	10	10	9	9	11	13	11	11
Taylor	10	10	11	11	11	11	14	16	16	16	17	17	16	15	14
Marshall	11	12	12	12	13	16	13	14	14	15	15	18	19	16	18
Randolph .....	.....	.....	14	14	14	14	12	13	13	12	13	14	14	14	13
Barbour	19	19	17	18	12	12	10	9	11	11	11	12	12	12	13
Raleigh	16	16	16	19	17	13	15	12	9	10	8	8	8	6	6
Putnam	12	13	13	13	15	15	16	15	15	14	18	16	17	17	17
Ohio	15	15	14	15	16	17	18	19	21	22	21	21	21	20	20
Brooke	17	18	18	20	20	20	23	22	17	17	15	15	15	18	16
Mason	14	14	15	16	18	19	19	20	22	21	22	22	22	22	22
Grant .....	.....	.....	.....	.....	.....	.....	22	18	19	19	20	20	20	21	21
Logan .....	.....	.....	.....	.....	.....	.....	.....	20	18	12	9	7	8	7	7
Monongalia	20	17	19	17	19	18	17	17	18	20	19	19	18	19	19
Hancock	18	20	20	21	21	21	20	21	24	24	23	25	26	24	27
Clay .....	.....	.....	.....	.....	.....	.....	25	23	23	24	27	30	30	30	25
Nicholas .....	.....	.....	.....	.....	.....	22	24	24	25	25	25	26	27	26	24
Lincoln .....	.....	.....	.....	.....	.....	23	21	23	27	26	30	30	25	28	28
Braxton .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26	23	23	23	23
Wayne .....	.....	.....	.....	.....	.....	.....	.....	.....	26	27	29	29	28	29	32
Upshur .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	27	24	24	25	24
Greenbrier .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	28	29	32	30
Lewis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31	31	32	33	33
Gilmer .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	32	31	31	31
Wyoming .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	34	34	34
Boone .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	27	26

The following table compiled from the same report, gives the coal production of Lincoln and Wayne counties for the year 1911:

PRODUCTION OF COAL IN LINCOLN AND WAYNE COUNTIES FOR THE YEAR ENDING
JUNE 30, 1911.

NAME OF COMPANY	NAME OF MINE	PRODUCTION OF COAL. Tons of 2,000 lbs.			DISTRIBUTION OF COAL Tons of 2,000 lbs.		
		First 6 Months	Second 6 Months	Total Produc- tion for year	Used in Operation	Furnished Local Trade & Tenants	Quantity Shipped from Mine
LINCOLN COUNTY.							
Branchland Coal Co.....	Branchland.....	30,910	25,199	56,109	11	553	55,773
Kenova Coal Mining Co....	Kenova No. 1.....	6,274	1,242	7,516	392	123	7,001
Guyan River Coal Co.....	Guyan.....	2,821	6,176	8,997	...	67	8,930
Totals .....	.....	40,005	32,617	72,622	403	743	71,704
WAYNE COUNTY							
East Lynn Coal Co.....	East Lynn No. 1.....	32,750	12,176	44,926	299	300	44,327

COALS OF THE CABELL-WAYNE-LINCOLN AREA.

It is difficult to estimate the number of workable seams of coal in the area under discussion, since it carries coals from the Monongahela series down to and including the Upper and a portion of the Middle Pottsville beds. The northern portion of the area contains some Pittsburgh coal of workable thickness, while the southern portion of the area carries the Upper Pottsville (Kanawha) coals.

The chemical analyses and determinations of heating values, given in the following pages were made by J. B. Krak, Assistant Chemist of the Survey, under the supervision of Prof. B. H. Hite, Chief Chemist.

The coal samples were taken carefully in the field work, and where possible the sample was obtained by digging down a section of the coal entirely across the face of the bed, excluding only such slates and partings as are taken out in mining operations. In the commercial mines these samples were crushed and quartered down to two or three pounds of coal, placed in tin cans, hermetically sealed, and sent to the laboratory of the Survey. The same methods of analysis were used as by the Fuel Testing Department of the United States Bureau of Mines, and United States Geological Survey.

The calorific value of the coals analyzed for this report is expressed in terms of British Thermal Units, the unit of heat measurement more commonly used in the United States. This unit of heat usually marked B. T. U., represents the amount of heat required to raise one pound of water one degree Fahrenheit in temperature. For instance, on pages 404-405 the table of coal analyses shows the Stockton-Lewiston bed at Branchland to have 12,920 B. T. U. for one pound of coal. The Pittsburgh bed in the Fairmont region gives from 14,000 to 14,400 B. T. U. for each pound of coal, and the New River and Pocahontas coals run from 15,000 to 15,500 B. T. U.

Along both the proximate and ultimate analysis is also given the B. T. U. result as well as the ratio of the total carbon to the oxygen plus ash. It has only recently been insisted upon that oxygen has about the same deteriorating

effect as ash in all coal and the above mentioned ratio, proposed by Dr. David White of the National Museum and United States Geological Survey, is the best yet devised for the classification of coals in order to show their relative rank in heating values.

The coals in the different series will now be described in descending order.

COALS OF THE MONONGAHELA SERIES.

The Pittsburgh Coal.

The only coal of commercial value in the Monongahela series is the Pittsburgh bed at a few localities in Cabell and Wayne counties, but even this bed is irregular and occurs only in scattered patches near the summits of the hills.

The sections showing the thickness of the different openings in this seam have already been given in the preceding pages of this volume, and from the measurements of these sections the following results are obtained:

QUANTITY OF PITTSBURGH COAL AVAILABLE.

It is difficult to make an accurate estimate of the amount of available tonnage of the Pittsburgh coal bed in the area under discussion, for the reason that this coal occurs in patches or pockets, and it is impossible to determine the exact area underlaid by the coal of workable thickness.

An approximate determination of the area of that portion of Cabell and Wayne counties has been made by districts within the boundary lines shown on the Economic Geology Map and the area of the coal calculated. Also the average thickness of the different openings given.

Cabell County.

District	No. of Openings.	Average Thickness	Area Sq. Mi.
Guyandotte	2	3' 2"	2
Barboursville ...	6	3 1	6
McComas	6	2 4	6
Totals	14	2' 10 $\frac{1}{3}$ "	14

Wayne County.

District	No. of Openings.	Average Thickness	Area Sq. Mi.
Butler	1	2' 6"	2
Ceredo	1	2 4	1
Union	6	3 2	5
Totals	8	2' 8"	8

From the preceding measurements given, it is found that the average thickness of the Pittsburgh coal in Cabell county is 2' 10 $\frac{1}{3}$ ", and that of Wayne county, 2' 8".

The following results are obtained by using these figures in calculating the available coal tonnage:

Table Showing Available Pittsburgh Coal in the Area.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Cabell	14.0	8,860	1,104,178,917	44,167,156
Wayne ...	8.0	5,120	597,746,442	23,909,858
Totals ..	22.0	13,980	1,701,925,359	68,077,014

In order to obtain the above results, it is assumed by the writer that one cubic foot of Pittsburgh coal weighs 80

pounds. These figures are the same as obtained for the weight of the Pittsburgh coal at the Fuel Testing Plant of the United States Geological Survey at St. Louis, Missouri.

COALS OF THE CONEMAUGH SERIES.

The Little Pittsburgh Coal.

This seam is mined in McComas district in Cabell county, and Union district, Wayne county, but it seems to occur in small patches, and is very irregular in its thickness. However, there is very little area underlaid by this bed, and no estimate can be made of its available tonnage, owing to its irregularity.

Elk Lick Coal.

Throughout a portion of Butler district in Wayne county, on Whites creek, the **Elk Lick** coal is mined for local fuel use. It is a difficult matter to determine the amount of available coal in this seam. It is probable that there is about 5 square miles of this bed.

QUANTITY OF ELK LICK COAL AVAILABLE.

From the measurements taken of the openings in the seam as given in a preceding chapter of this Volume, we are able to arrive at the following results:

Wayne County.

District	No. of Openings	Average Thickness	Area Sq. Mi.
Butler	3	2' 11"	5.0

Table Showing Available Elk Lick Coal.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Wayne ...	5	3,200	407,024,640	16,280,986

In order to obtain the above results, it is assumed by the writer that one cubic foot of Elk Lick coal weighs 80 pounds.

Brush Creek Coal.

It is impossible to make an accurate calculation of the available coal in this bed, as the coal is impure and of very little commercial value.

COALS OF THE ALLEGHENY SERIES.

Upper Freeport Coal.

Throughout a portion of northern Lincoln this coal reaches a thickness that makes it of commercial value, and also a portion of the western part of Wayne county.

QUANTITY OF UPPER FREEPORT COAL AVAILABLE.

In the preceding pages of this volume, the sections of the different coal openings in this seam, in the Cabell-Wayne-Lincoln area have been given as well as their location and elevation.

An approximate determination of the area of that portion of Lincoln and Wayne counties has been made by districts within the boundary lines shown on the Economic Geology map and the area of coal calculated. Also the average thickness of the different openings given.

District	No. of Openings	Average Thickness	Area Sq. Mi.
LINCOLN CO.			
Carroll	11	2' 7"	40
Duval	4	2 6	30
Sheridan	2	1 8	2
Washington	6	3 1	4
Union	2	2 0	20
Jefferson	1	2 3	14
Totals	22	2' 2 $\frac{1}{2}$ Ave.	113
WAYNE CO.			
Butler .....	..	2' 0"	18

From the foregoing measurements and assuming 80 pounds as the weight of a cubic foot of coal, we are able to arrive at the following results:

Table Showing Available Upper Freeport Coal.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Lincoln ..	113	74,880	7,110,664,704	284,426,588
Wayne ...	18	11,520	1,003,622,400	40,144,896
Totals .	131	86,300	8,114,297,100	324,571,484

Lower Freeport Coal.

The Lower Freeport coal is almost altogether absent from the Cabell-Wayne-Lincoln area, so no estimate of available coal is made of this bed.

QUANTITY OF NO. 5 BLOCK COAL AVAILABLE.

It will be a difficult matter to get a fair calculation of the approximate amount of available coal tonnage of the No. 5 Block seam in the Cabell-Wayne-Lincoln area. From the location and the sections of the different openings given on the preceding pages of this volume, it is evident that the No.

5 Block is one of the most important coals in this area. As this seam does not come to the surface in Cabell county and no core drill test holes have been sunk to determine its thickness, no attempt will be made to calculate its available tonnage therein.

In **Lincoln county** the No. 5 Block coal is of workable thickness in the eastern and southern portions.

In **Wayne county** the No. 5 Block coal is of workable thickness south of the center of same.

An approximate determination of the area of that portion of Lincoln and Wayne counties has been made by districts, and the area of the coal calculated, also the average thickness of the different openings given.

District	No. of Openings	Average Thickness	Area Sq. Mi.
LINCOLN CO.			
Washington	4	2' 8 "	25
Duval	5	2 10½	50
Union	6	3 3	25
Jefferson	17	3 7	25
Laurel Hill.....	3	2 8	30
Harts Creek.....	7	4 0½	40
Totals	32	3 2 Ave.	195
WAYNE CO.			
Stonewall	16	3 7	60
Grant	15	3 4	45
Lincoln	7	3 7½	65
Butler	3	2 6	5
Totals	41	3 3 Ave.	175

Table Showing Available No. 5 Block Coal.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Lincoln ...	195	124,800	17,272,888,528	690,626,027
Wayne ...	175	112,000	15,889,991,040	635,599,641
Totals ..	370	236,800	33,162,279,568	1,326,225,668

In making the calculations of the area over which the No. 5 Block coal has thickness and purity enough to be of commercial value, the writer has used all the available data that could be had on the study of the area, and this data is hardly sufficient to make an accurate calculation of the available tonnage, so it is possible that the preceding figures may be increased after the coal has been thoroughly prospected.

COALS OF THE POTTSVILLE SERIES.

The Stockton-Lewiston Coal Available.

To make an accurate calculation of the available coal in the Stockton bed is practically impossible owing to the meager data at hand.

In Lincoln county the Stockton-Lewiston bed reaches its maximum thickness in Washington and Duval districts in the eastern part of the county. The seam is also mined at Branchland and Brown City in Sheridan district on Guyandot river. The sections given on preceding pages show that the seam is a multiple bed, being divided with slate, fire clay, and sandstone partings.

The following is a list of openings and approximate area by districts of the Stockton-Lewiston available coal:

District	No. of Openings	Average Thickness	Area Sq. Mi.
LINCOLN CO.			
Washington	7	5' 10½"	15
Duval	2	5 4½	10
Jefferson	8	3 1	20
Sheridan	9	3 10½	10
Laurel Hill.....	3	3 9	20
Harts Creek....	6	2 3	15
Totals	35	4 0½ Ave.	90
WAYNE CO			
Stonewall	1	3 1	10
Grant	7	3 2	20
Totals	8	3 0½	30

From the foregoing measurements the following results are obtained:

Table Showing Available Stockton-Lewiston Coal.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Lincoln ...	90	57,600	10,136,586,240	405,463,450
Wayne ...	30	19,200	2,613,600,000	104,544,000
Totals ..	120	76,800	12,750,186,240	510,007,450

Coalburg Coal Available.

From the meager data that was obtained of the Coalburg bed in this area, no attempt could be made to calculate the available coal tonnage of this seam. From the sections given in the preceding pages, it is evident that there is some coal of commercial value in this bed, in southern Lincoln and Wayne counties, but the bed contains a great many slate and fire clay partings, and until more prospecting is done on this seam it is not possible to estimate its true value.

Winifrede Coal Available.

The Winifrede bed has practically the same characteristics as the Coalburg in the area under discussion and there doubtless will be considerable coal of commercial value in this bed in the southern part of Wayne and Lincoln counties; yet from the meager information that the writer was able to gather, no attempt will be made to calculate the available coal in this bed.

The No. 2 Gas Coal (Warfield).

The No. 2 Gas coal comes to the surface in southern Lincoln and in southern Wayne counties and shows a coal of commercial thickness and purity. Just what area of the

southern part of Lincoln and Wayne counties is underlaid with this bed of commercial value can only be determined by the records of the oil and gas wells.

The following table is taken from the logs of wells (See other pages of this report for the complete well record) drilled for oil and gas in the area where the coal appears to be merchantable:

Table of Wells Showing Depth to and Thickness of the No. 2 Gas Coal in Lincoln and Wayne Counties.

No. on Map	Name of Well	Elevation of well	No. 2 Gas Depth Feet	Thickness Feet
Wayne County:				
6	Guyandotte Land Assoc.....	659-L	275	3
15	Thos. Stepp Heirs No. 2.....	700	65	5
18	Glen Hayes Co. No. 2.....	620	208	2
19	Glen Hayes Co. No. 1.....	635	307	2
23	Caldwell & Colton.....	685	156	6
30	Frank Adkins.....	723	300	7
Lincoln County:				
569	D. G. Courtney.....	850	500	5
573	Lincoln Land Assoc. No. 6.....	725	312	2

Under the column headed "Depth" in the above table, the figures given express distance in feet from the top of the hole and not the depth below drainage. The table gives the following results:

Wayne County.

Average thickness of No. 2 Gas Coal.....4' 2"

Lincoln County.

Average thickness of No. 2 Gas Coal.....3' 6"

The writer has assumed from the well records that there are 100 square miles of the No. 2 Gas coal in southern Lincoln county and 140 square miles in southern Wayne county.

Therefore, the writer in forming an estimate of the available coal tonnage in the area under discussion feels safe in assuming a thickness of 3' 6" underlying 100 square miles in Lincoln county and an area of 140 square miles of coal in Wayne county of an average thickness of 4' 2".

Figuring on this basis we get the following results:

Table Showing Approximate Available No. 2 Gas Coal.

County	Sq. Mi.	Acres	Cu. ft. of Coal	Short Tons of Coal
Lincoln ..	100	64,000	9,757,440,000	390,297,600
Wayne ...	140	89,600	16,275,409,920	651,016,397
Totals ..	240	153,600	26,032,849,920	1,041,313,997

SUMMARY OF AVAILABLE COAL IN THE THREE COUNTIES.

Name of Bed.	Short Tons.
Pittsburgh	68,077,014
Elk Lick.....	16,280,986
Upper Freeport.....	324,571,484
No. 5 Block.....	1,326,225,668
Stockton-Lewiston	510,007,450
No. 2 Gas.....	1,041,313,997
Total	3,286,476,599

The above estimate of available tonnage of workable coal in the area under discussion does not necessarily mean that that amount will eventually be taken out. The percentage of any coal bed recovered under the present mining methods in the State varies from 45 to 90 per cent. The writer is of the opinion that a percentage of recovery of 60 per cent of the above total of available coal would be a fair approximation of the amount eventually recovered. Figuring on this basis,

our available tonnage of 3,286,476,599 in the three counties is reduced in round numbers to 1,971,885,959 short tons.

LOCATION OF SAMPLES IN TABLES.

Pittsburgh Coal:

Cabell county, Grant district.

Serial
No.

- 1 Outcrop coal, John Guinn's property, C. & O. Ry. cut, 3 miles west of Milton.

Cabell county, Barboursville district.

- 2 Mine on land of Chas. Hencehkohn, near Cox Landing, Map No. 4, page 101.
- 3 Mine on land of Chas. Hencehkohn, near Cox Landing, Map No. 3, page 101.

Wayne county, Union district.

- 4 Mine on land of Sylvester Aliff, near Herbert, Map No. 28, page 107.
- 5 Mine on land of J. W. Graham, near Lavalette, Map No. 29, page 107.

Little Pittsburgh Coal:

Cabell county, Grant district.

- 6 Mine on land of Thos. Keyser, near Ona, Map No. 35, page 120.

Elk Lick Coal:

Wayne county, Butler district.

- 7 Mine on land of G. W. Ely, near Pharoah, Map No. 39, page 125.
- 8 Mine on land of J. R. Rutherford, near Pharoah, Map No. 41, page 126.

Upper Freeport Coal:

Lincoln county, Carroll district.

- 9 Mine on land of W. W. Baker, near Hamlin, Map No. 43, page 165.
- 10 Mine on land of Jesse Wilkinson, near Hamlin, Map No. 42, page 164.
- 11 Mine on land of Alexander Wheeler, near Hamlin, Map No. 46 page 166.
- 12 Mine on land of William Black, near Jenks, Map No. 55, page 168.
- 13 Mine on land of Aaron Martin, near Hamlin, Map No. 45, page 166.
- 14 Mine on land of Ernest Keeton, near Griffithsville, Map No. 57, page 168.
- 15 Mine on land of Henry Miller, near Griffithsville, Map No. 58a, page 169.

Analyses of Coals in Cabell, Wayne and Lincoln Counties.

(Under the heading "Condition of Sample," "A. D."=air dried, and "A. R."=as received).

Serial No.	MINE.	COUNTY.	HORIZON.	Condition of Sample.	PROXIMATE.					ULTIMATE.							Calorimeter B. T. U. for 1 lb. of coal.	Calculated B. T. U. for 1 lb. of coal.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.		
1	John Guinn.....	Cabell....	Pittsburgh	A. R.	3.45	39.42	51.30	0.032	5.83	2.31								
2	Chas. Hancekohn.....	Cabell....	Pittsburgh	A. R.	1.50	44.42	47.34	0.013	6.74	3.56	69.99	5.35	13.25	1.11	3.56	6.74	12850	12620
3	Chas. Hancekohn.....	Cabell....	Pittsburgh	A. D.	1.38	44.47	47.40	0.013	6.75	3.57	70.06	5.35	13.16	1.11	3.57	6.75	12860	12630
3	Chas. Hancekohn.....	Cabell....	Pittsburgh	A. D.	1.60	43.08	47.47	0.036	7.85	3.27	71.25	5.01	11.65	0.97	3.27	7.85	12730	12700
3	Chas. Hancekohn.....	Cabell....	Pittsburgh	A. R.	2.22	42.81	47.17	0.036	7.80	3.25	70.81	5.05	12.13	0.96	3.25	7.80	12650	12620
4	Sylvester Aliff.....	Wayne....	Pittsburgh	A. D.	1.86	39.99	51.67	0.007	6.48	1.92	73.24	5.11	11.96	1.29	1.92	6.48	12960	12970
4	Sylvester Aliff.....	Wayne....	Pittsburgh	A. R.	2.24	39.83	51.47	0.007	6.46	1.91	72.95	5.13	12.27	1.28	1.91	6.46	12910	12920
5	J. W. Graham.....	Wayne....	Pittsburgh	A. D.	2.60	36.96	45.44	0.016	15.00	5.25	62.31	3.81	12.65	0.98	5.25	15.00	11420	10660
5	J. W. Graham.....	Wayne....	Pittsburgh	A. R.	3.08	36.77	45.22	0.016	14.93	5.23	62.01	3.84	13.02	0.97	5.23	11.93	11360	10600
	Average.....				2.21	40.86	48.28	0.020	8.65	3.36	69.08	4.83	12.51	1.08	3.50	9.00	12168	12215
6	Thos. Keyser.....	Cabell....	Little Pittsburgh.....	A. R.	3.68	39.82	46.83	0.027	9.67	5.37								
7	G. W. Ely.....	Wayne....	Elk Lick.....	A. R.	2.56	36.89	51.58	0.040	8.97	1.22								
8	J. R. Rutherford.....	Wayne....	Elk Lick.....	A. R.	2.18	36.07	44.60	0.043	17.15	1.74								
	Average.....				2.37	36.48	48.09	0.042	13.06	1.48								
9	W. W. Baker.....	Lincoln...	Upper Freeport.....	A. D.	0.81	42.84	43.30	0.011	13.05	4.71	66.60	4.80	9.75	1.09	4.71	13.05	12280	12100
9	W. W. Baker.....	Lincoln...	Upper Freeport.....	A. R.	1.68	42.47	42.91	0.011	12.94	4.67	66.01	4.85	10.45	1.08	4.67	12.94	12170	11990
10	Jesse Wilkinson.....	Lincoln...	Upper Freeport.....	A. D.	1.53	38.37	42.75	0.029	17.35	4.90	60.22	4.86	11.66	1.01	4.90	17.35	11480	11070
10	Jesse Wilkinson.....	Lincoln...	Upper Freeport.....	A. R.	1.69	38.31	42.68	0.029	17.32	4.89	60.12	4.87	11.79	1.01	4.89	17.32	11460	11050
11	Alexander Wheeler.....	Lincoln...	Upper Freeport.....	A. R.	1.71	38.43	48.03	0.010	11.83	4.68								
12	William Black.....	Lincoln...	Upper Freeport.....	A. R.	0.60	40.70	51.90	0.006	6.80	1.24								
13	Aaron Martin.....	Lincoln...	Upper Freeport.....	A. R.	2.02	39.28	43.85	0.003	14.85	4.68								
14	Ernest Ketton.....	Lincoln...	Upper Freeport.....	A. R.	2.45	38.25	46.28	0.011	13.02	4.97								
15	Henry Miller.....	Lincoln...	Upper Freeport.....	A. R.	1.92	37.24	52.66	0.005	8.18	1.26								
16	Mary Plummer.....	Lincoln...	Upper Freeport.....	A. D.	0.85	39.65	49.77	0.080	9.73	3.19	70.98	4.20	10.76	1.11	3.19	9.73	12390	12230
16	Mary Plummer.....	Lincoln...	Upper Freeport.....	A. R.	1.30	39.47	49.55	0.080	9.68	3.17	70.66	4.24	11.12	1.13	3.17	9.68	12340	12180
17	S. W. Oxley.....	Lincoln...	Upper Freeport.....	A. R.	0.58	41.15	46.71	0.016	11.56	4.14								
18	John Stowers.....	Lincoln...	Upper Freeport.....	A. R.	0.81	40.01	48.01	0.008	11.17	1.22								
19	Henry Miller.....	Lincoln...	Upper Freeport.....	A. R.	2.69	35.96	45.69	0.027	15.66	5.34								
20	Daniel Pridemore.....	Lincoln...	Upper Freeport.....	A. R.	2.43	39.96	45.96	0.009	11.45	4.03								
21	Virginia Land Co.....	Lincoln...	Upper Freeport.....	A. R.	1.30	38.17	52.93	0.007	7.60	1.40								
22	Horse Creek Coal & Min. Co.	Lincoln...	Upper Freeport.....	A. D.	1.77	37.60	53.85	0.005	6.74	1.22	74.96	4.78	11.10	1.20	1.22	6.74	13330	13050
22	Horse Creek Coal & Min. Co.	Lincoln...	Upper Freeport.....	A. R.	2.98	37.14	53.22	0.005	6.66	1.21	74.04	4.85	12.05	1.19	1.21	6.66	13170	12890
23	Seaboard Fuel Co.....	Lincoln...	Upper Freeport.....	A. D.	1.25	41.20	48.37	0.009	9.18	0.99	70.30	4.04	11.27	1.22	0.99	9.18	11530	11670
23	Seaboard Fuel Co.....	Lincoln...	Upper Freeport.....	A. R.	2.11	40.85	47.94	0.009	9.10	0.99	69.69	4.10	14.91	1.21	0.99	9.10	11430	11570
24	Seaboard Fuel Co.....	Lincoln...	Upper Freeport.....	A. R.	3.50	35.20	52.49	0.005	8.81	0.95								
25	Miller Lester.....	Lincoln...	Upper Freeport.....	A. R.	3.06	33.80	46.95	0.050	16.19	5.07								
					1.77	38.91	48.00	0.019	11.32	3.13	68.36	4.56	11.79	1.13	2.99	11.17	12158	11980
26	John Gilkerson.....	Wayne....	Lower Freeport.....		1.90	39.78	48.89	0.029	9.43	2.72								
27	Calaway Bragg.....	Lincoln...	No. 5 Block.....	A. R.	1.73	38.53	53.53	0.004	6.21	1.40								
28	Kelly Spurlock.....	Lincoln...	No. 5 Block.....	A. R.	1.32	41.46	50.87	0.009	6.35	1.66								
29	S. A. Egnor.....	Lincoln...	No. 5 Block.....	A. R.	1.41	38.84	51.53	0.011	8.22	1.42								

Analyses of Coals in Cabell, Wayne and Lincoln Counties.

(Under the heading "Condition of Sample," "A. D."=air dried, and "A. R."=as received).

Serial No.	MINE.	COUNTY.	HORIZON.	Condition of Sample.	PROXIMATE.						ULTIMATE.						Calorimeter B. T. U. for 1 lb. of coal.	Calculated B. T. U. for 1 lb. of coal.
					Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.		
65	Guyandotte Land Assn.....	Lincoln...	Stockton-Lewiston ...	A. R.	1.99	37.25	55.35	0.005	5.41	1.10								
66	Samuel Adkins.....	Lincoln...	Stockton-Lewiston ...	A. R.	2.06	37.75	49.15	0.004	11.04	0.76								
67	Abraham Sanson.....	Lincoln...	Stockton-Lewiston ...	A. D.	1.72	38.08	54.34	0.005	5.86	1.72	74.27	5.13	11.83	1.19	1.72	5.86	13290	13140
67	Abraham Sanson.....	Lincoln...	Stockton-Lewiston ...	A. R.	1.91	38.01	54.23	0.005	5.85	1.71	74.12	5.14	11.99	1.19	1.71	5.85	13260	13110
68	Claud Linville.....	Lincoln...	Stockton-Lewiston ...	A. R.	0.93	38.50	55.32	0.007	5.25	1.09								
69	John Brumfield.....	Lincoln...	Stockton-Lewiston ...	A. D.	2.00	39.56	54.67	0.004	3.77	0.77	72.52	4.99	16.73	1.22	0.77	3.77	13270	12380
69	John Brumfield.....	Lincoln...	Stockton-Lewiston ...	A. R.	3.09	39.12	54.07	0.004	3.72	0.76	71.71	5.05	17.55	1.21	0.76	3.72	13120	12240
70	Milt. Egnor.....	Lincoln...	Stockton-Lewiston ...	A. R.	0.75	46.00	41.05	0.011	12.20	0.69								
71	Seth Miller.....	Lincoln...	Stockton-Lewiston ...	A. R.	1.90	37.60	50.30	0.011	10.20	2.88								
72	A. Sanson.....	Lincoln...	Stockton-Lewiston ...	A. R.	2.50	36.45	56.78	0.007	4.27	0.70								
73	Seaboard Fuel Co.....	Lincoln...	Stockton-Lewiston ...	A. D.	0.35	36.95	55.22	0.011	7.48	0.84	71.26	5.00	14.11	1.31	0.84	7.48	13360	12410
73	Seaboard Fuel Co.....	Lincoln...	Stockton-Lewiston ...	A. R.	0.78	36.79	54.99	0.011	7.44	0.84	70.95	5.03	14.44	1.30	0.84	7.44	13300	12350
74	Mohler Bros.....	Lincoln...	Stockton-Lewiston ...	A. D.	0.73	41.57	49.80	0.008	7.90	4.44	68.86	5.16	12.45	1.19	4.44	7.90	12690	12430
74	Mohler Bros.....	Lincoln...	Stockton-Lewiston ...	A. R.	1.27	41.35	49.52	0.008	7.86	4.42	68.49	5.19	12.66	1.18	4.42	7.86	12620	12360
75	Seaboard Fuel Co.....	Lincoln...	Stockton-Lewiston ...	A. D.	0.82	37.48	53.54	0.015	8.16	0.78	69.88	5.11	14.77	1.30	0.78	8.16	13010	12220
75	Seaboard Fuel Co.....	Lincoln...	Stockton-Lewiston ...	A. R.	1.83	37.09	53.00	0.015	8.08	0.77	69.17	5.16	15.53	1.29	0.77	8.08	12880	12100
76	Horse Creek Land & Min. Co.	Lincoln...	Stockton-Lewiston ...	A. D.	0.77	39.41	54.74	0.032	5.08	0.74	74.78	5.24	12.72	1.44	0.74	5.08	13720	13170
76	Horse Creek Land & Min. Co.	Lincoln...	Stockton-Lewiston ...	A. R.	1.53	39.10	54.33	0.032	5.04	0.73	74.21	5.29	13.31	1.42	0.73	5.04	13620	13070
77	Mohler Bros.....	Lincoln...	Stockton-Lewiston ...	A. D.	5.66	33.84	56.58	0.010	3.92	0.78	68.96	5.38	19.83	1.13	0.78	3.92	12390	11860
77	Mohler Bros.....	Lincoln...	Stockton-Lewiston ...	A. R.	7.08	33.33	55.73	0.010	3.86	0.77	67.93	5.47	20.86	1.11	0.77	3.86	12210	11680
	Average.....				2.11	37.96	53.05	0.010	6.88	1.30	70.95	5.12	14.75	1.25	1.44	6.49	12979	12412
78	Guyandotte Land Assn.....	Wayne...	Coalburg	A. D.	3.52	36.03	54.47	0.009	5.98	0.69	73.11	5.02	13.89	1.31	0.69	5.98	12910	12700
78	Guyandotte Land Assn.....	Wayne...	Coalburg	A. R.	4.18	35.79	54.10	0.009	5.93	0.69	72.61	5.06	14.41	1.30	0.69	5.93	12820	12610
79	John Tomlin.....	Wayne...	Coalburg	A. D.	0.92	40.40	55.85	0.008	2.83	0.67	78.60	5.07	11.41	1.42	0.67	2.83	13900	13720
79	John Tomlin.....	Wayne...	Coalburg	A. R.	1.16	40.30	55.72	0.008	2.82	0.67	78.40	5.10	11.60	1.41	0.67	2.82	13870	13690
	Average.....				2.44	38.13	55.04	0.0085	4.39	0.68	75.68	5.06	12.83	1.36	0.68	4.39	13375	13180
80	Glenhayes Land Co.....	Wayne...	Winifrede	A. R.	3.70	39.27	51.60	0.006	5.43	0.87								
81	R. W. Nelson.....	Wayne...	Winifrede	A. R.	2.85	36.48	52.74	0.006	7.93	0.56								
82	Albert Gartner.....	Lincoln...	Winifrede	A. R.	2.73	36.70	52.31	0.003	8.26	1.04								
83	Thomas Vickers.....	Lincoln...	Winifrede	A. R.	2.41	40.79	54.94	0.003	1.86	0.62								
	Average.....				2.92	38.31	52.90	0.0045	5.87	0.77								
84	Guyandotte Land Assn.....	Lincoln...	Chilton	A. R.	1.35	39.95	57.30	0.050	1.40	0.70								
85	Albert Toney.....	Lincoln...	Chilton	A. R.	1.98	36.74	56.06	0.003	5.22	0.70								
	Average.....				1.66	38.35	56.68	0.0265	3.31	0.70								
86	Boone Co. Coal Corp.....	Logan....	No. 2 Gas.....	A. D.	0.72	33.86	58.64	0.006	6.78	0.65	78.76	4.85	7.50	1.46	0.65	6.78	13730	13900
86	Boone Co. Coal Corp.....	Logan....	No. 2 Gas.....	A. R.	1.41	33.62	58.24	0.006	6.73	0.65	78.22	4.89	8.06	1.45	0.65	6.73	13640	13810
87	M. H. Walden.....	Wayne...	No. 2 Gas.....	A. D.	1.08	40.08	55.52	0.007	3.32	1.84	77.76	5.44	10.34	1.30	1.84	3.32	14090	13960
87	M. H. Walden.....	Wayne...	No. 2 Gas.....	A. R.	1.24	40.02	55.42	0.007	3.32	1.84	77.63	5.45	10.46	1.30	1.84	3.32	14070	13940
88	Brad Toney.....	Lincoln...	No. 2 Gas.....	A. R.	1.96	39.29	55.81	0.005	2.94	1.32								
	Average.....				1.28	37.37	56.73	0.006	4.62	1.26	78.09	5.16	9.09	1.38	1.24	5.04	13882	13905

Lincoln county, Union district.

- 16 Mine on land of Mary Plummer, near Griffithsville, Map 76, page 174.
- 17 Mine on land of S. W. Oxley, near Griffithsville, Map 75, page 174.

Lincoln county, Duval district.

- 18 Mine on land of John Stowers, near Griffithsville, Map No. 60, page 169.
- 19 Mine on land of Henry Miller, in Griffithsville, Map No. 59, page 169.
- 20 Mine on land of Daniel Pridemore, near Griffithsville, Map No. 49, page 167.
- 21 Mine on land of Virginia Land Company, Griffithsville, Map No. 61, page 170.

Lincoln county, Washington district.

- 22 Mine on land of C. Wilkerson, near Woodville, Map No. 71, page 172.
- 23 Mine on land of the Seaboard Fuel Co., near MacCorkle, Map No. 68, page 171.
- 24 Mine on land of the Seaboard Fuel Co., near MacCorkle, Map No. 70, page 172.

Wayne county, Union district.

- 25 Mine on land of Millard Lester, near Gilkerson, Map No. 83, page 177.

Lower Freeport Coal:**Wayne county, Stonewall district.**

- 26 Mine on land of John Gilkerson, near Gilkerson, Map No. 92, page 180.

No. 5 Block Coal:**Lincoln county, Jefferson district.**

- 27 Mine on land of Calaway Bragg, near Bernie P. O., Map No. 126, page 198.
- 28 Mine on land of Kelley Spurlock, near Spurlockville, Map No. 120, page 196.
- 29 Mine on land of S. A. Egnor, near Bulger, Map No. 116, page 194.
- 30 Mine on land of D. G. Courtney, near Spurlockville, Map No. 127, page 199.
- 31 Mine on land of Wilburn Hill, near Bulger, Map No. 125, page 198.
- 32 Mine on land of Wm. Hill, near Spurlockville, Map No. 118, page 195.
- 33 Mine on land of J. R. Clay, near Spurlockville, Map No. 115, page 194.
- 34 Mine on land of A. T. Dotson, near Spurlockville, Map No. 114, page 193.
- 35 Mine on land of Peter Clark, near Stiltner, Map No. 144, page 206.
- 36 Mine on land of John Clark, near Bulger, Map No. 111, page 192.
- 37 Mine on land of Benton Skeens, near Jenks, Map No. 122, page 197.

Lincoln county, Union district.

- 38 Mine on land of Scites, near Jenks, Map No. 106, page 190.
- 39 Mine on land of Caleb Adkins, near Palermo, Map No. 108, page 191.
- 40 Mine on land of R. N. Smith, near Spurlockville, Map No. 110, page 192.
- 41 Mine on land of John Smith, near Jenks, Map No. 105, page 190.
- 42 Mine on land of Mordecai Adkins, near Palermo, Map No. 107, page 191.

Lincoln county, Washington district.

- 43 Mine on land of J. C. Meadows, near Woodville, Map No. 97a, page 188.
- 44 Mine on land of Seaboard Fuel Co., near MacCorkle, Map No. 97, page 187.

Lincoln county, Duval district.

- 45 Mine on land of Noah Turley, near Woodville, Map No. 101, page 188.

Lincoln county, Harts Creek district.

- 46 Mine on land of McKinsey Coal Co., near Fry, Map No. 140, page 203.
- 47 Mine on land of Harrison Noe, near Hart, Map No. 138, page 203.
- 48 Mine on land of Lincoln Land Assn., near Leete, Map No. 139, page 203.

Wayne county, Butler district.

- 49 Mine on land of Jas. Ferguson, near Ft. Gay, Map No. 186a, page 223.

Wayne county, Lincoln district.

- 50 Outcrop coal on land of Glenhayes Land Co., near Glenhayes, Map No. 184, page 221.
- 51 Mine on land of S. J. Ferguson, near Ferguson, Map No. 179, page 220.
- 52 Mine on land of S. J. Ferguson, near Ferguson, Map No. 180, page 220.

Wayne county, Stonewall district.

- 53 Mine on land of Julia Napier, near East Lynn, Map No. 161, page 213.
- 54 Mine on land of Walter Osborne, near East Lynn, Map No. 148, page 208.
- 55 Mine on land of Noble Watts, near Stiltner, Map No. 145, page 207.
- 56 Mine on land of Wm. Perry, near East Lynn, Map No. 146, page 207.
- 57 Mine on land of Wm. Napier, near East Lynn, Map No. 147, page 208.
- 58 Mine on land of Nathan McClellan, near Stiltner, Map No. 144a, page 207.
- 59 Mine on land of East Lynn Coal Co., East Lynn, Map No. 150, page 209.

Wayne county, Grant district.

- 60 Mine on land of Guyandotte Land Assn., near Cove Gap, Map No. 164, page 215.
- 61 Mine on land of Joseph L. Pack, near Cove Gap, Map No. 162, page 214.

- 62 Mine on land of Guyandotte Land Assn., near Kiahville, Map No. 173, page 218.

Stockton-Lewiston Coal:

Lincoln county, Sheridan district.

- 63 Mine on land of Branchland Coal Co., near Brown City, Map No. 206, page 245.
64 Mine of Branchland Coal Co., Branchland, Map No. 203, page 244.
65 Mine on land of Guyandotte Land Assn., near Branchland, Map No. 210, page 246.

Lincoln county, Harts Creek district.

- 66 Mine on land of Samuel Adkins, near Hart, Map No. 218, page 249.

Lincoln county, Jefferson district.

- 67 Mine on land of Abraham Sanson, near Palermo, Map No. 196, page 241.
68 Mine on land of Claude Linville, near Jenks, Map No. 195a, page 240.
69 Mine on land of John Brumfield, near Leete, Map No. 199, page 242.
70 Mine on land of Milton Egnor, near Palermo, Map No. 198, page 241.
71 Mine on land of Seth Miller, near Palermo, Map No. 197, page 241.
72 Mine on land of A. A. Sanson, near Palermo.

Lincoln county, Washington district.

- 73 Mine on land of the Seaboard Fuel Co., near MacCorkle, Map No. 187, page 236.
74 Outcrop opening on land of Mohler Bros., near Ivy, Map No. 190, page 237.
75 Mine on land of the Seaboard Fuel Co., near MacCorkle, Map No. 188, page 236.
76 Mine on property of Horse Creek Land & Min. Co., near Woodville, Map No. 193, page 239.
77 Mine on land of Mohler Bros., near Ivy, Map No. 190, page 237.

Coalburg Coal:

Wayne county, Lincoln district.

- 78 Outcrop opening on land of Guyandotte Land Assn., near Wilsongdale, Map No. 241, page 259.

Wayne county, Grant district.

- 79 Outcrop opening on land of John Tomlin, near Eloise, Map No. 237, page 258.

Winifrede Coal:

Wayne county, Lincoln district.

- 80 Outcrop opening on land of Glenhayes Land Co., near Glenhayes, Map No. 254a, page 268.

Wayne county, Grant district.

- 81 Outcrop opening on land of R. W. Nelson, near Kiahville, Map No. 254b, page 268.

Lincoln county, Laurel Hill district.

- 82 Mine on land of Albert Gartner, near Ranger, Map No. 254c, page 267.
83 Mine on land of Thos. Vickers, near Lattin, Map No. 248a, page 263.

Chilton Coal:**Lincoln county, Harts Creek district.**

- 84 Outcrop opening on land of Guyandotte Land Assn., near Atenville, Map No. 256a, page 270.

Lincoln county, Jefferson district.

- 85 Mine on land of Albert Toney, near Leete, Map No. 257, page 270.

No. 2 Gas Coal.**Logan county, Chapmansville district.**

- 86 Boone County Corporation, near Clothier.

Wayne county, Lincoln district.

- 87 Mine on land of M. H. Walden, near Kermit, page 273.

Lincoln county, Harts Creek district.

- 88 Mine on land of Brad Toney, near Toney, page 274.

CHAPTER XII.

CLAYS, ROAD MATERIALS, BUILDING STONES, IRON ORES, AND CARBON BLACK INDUSTRY.

THE CLAYS AND CLAY INDUSTRY IN CABELL, WAYNE AND LINCOLN COUNTIES.

The clays of the Cabell-Wayne-Lincoln area are all of sedimentary origin, and have reached their present position through the agency of water. They may be divided into two classes as regards to both age and adaptability: first, the bedded clays, and second, recent unconsolidated silts or clays of the stream valleys. The former are the most important.

For description purposes, clays may be regarded as either plastic or non-plastic. The non-plastic is known as the flint clay.

CLAYS IN THE DUNKARD SERIES.

The clays highest geologically in the area described in this volume are those in the Dunkard series. As a rule, the plastic clays in this volume are the under clays of the coal beds. The Dunkard series only touches the tops of the highest hills in the northern portion of the area. Thus there is a very small area of clays in this series, and they represent very little commercial value.

CLAYS IN THE MONONGAHELA SERIES.

The clays in the Monongahela series are the clays under the Waynesburg, Uniontown and Pittsburgh coals.

The clay underlying the Pittsburgh coal ranges in thickness from one foot to eight feet, and is very plastic. It is present in the hills in the northern part of the area, and is conveniently situated in respect to transportation and fuel.

A sample of this clay taken from the Chesapeake & Ohio Railroad grade cut just south of Milton and an analysis made of same in the laboratory of the West Virginia Geological Survey, gave the following results:

Pittsburgh Fire Clay Analysis.

	Per cent.
Silica (Si O_2).....	69.10
Ferric Iron (Fe_2O_3).....	3.26
Alumina (Al_2O_3).....	15.23
Lime (Ca O).....	0.19
Magnesia (MgO).....	0.82
Sodium (Na_2O).....	1.13
Potassium (K_2O).....	2.79
Titanium (Ti O_2).....	0.59
Phosphoric Acid (P_2O_5).....	0.01
Moisture	2.35
Loss of ignition.....	4.84
Total	100.31

This bed of clay continues throughout a portion of Cabell county along the Ohio river and in Teays Valley and appears to be from 2 to 4 feet thick. From its chemical composition it would make an excellent building and paving brick, but contains too much Iron and Alkalies for a good firebrick.

CLAYS IN THE CONEMAUGH SERIES.

As a rule, the clays in the **Conemaugh series** are plastic and are the under clays of coal beds. The Conemaugh coal beds are irregular both in distribution and in thickness, and the same is true of the beds of clay. The clay in this formation has not been worked at any place, so far as is known, in the area under discussion.

The shales in this formation are abundant and wide spread. Thus far these shales have not been utilized very

much. They would make a fine grade of red brick, and some of the layers would doubtless make a good quality of ornamental tiling for hearths, mantels, etc. Also possibly some of these shales would make a good grade of red paint. A good grade of red roofing tile is being manufactured at Huntington from the "Pittsburgh reds." These tiles are quite hard and great durability is claimed for them by the manufacturers.

The clay in the "Pittsburgh reds" is utilized at Barboursville by the Barboursville Clay Manufacturing Co., and a description of their plant is given in the preceding pages.

CLAYS IN THE ALLEGHENY SERIES.

There is bed of clay at the base of the Allegheny series from 10 to 40 feet above the top of the Homewood sandstone along Big Sandy river, also another bed of fire clay, 70 to 80 feet above the lower bed, or 110 to 120 feet above the base of the Homewood sandstone.

The following section is exposed in a railroad cut of the Norfolk & Western Railroad at Ft. Gay, just south of the depot, and was measured with hand level:

Ft. Gay Section, Wayne County.

	Thickness Feet.	Total. Feet.
Sandstone, massive Mahoning.....	25	25
Concealed	19	44
Fire clay (olive drab).....	4	48
Sandstone	10	58
Fire clay.....	2	60
Sandstone, ferruginous.....46' }	49	109
Sandstone, brecciated..... 2 }		
Sandstone, ferruginous..... 1 }		
Sandy shale.....	2	111
Slate	1 6"	112 6"
Coal	6"	113
Sandy shale and sandstone.....	5 10"	118 10"
Coal, blossom.....	2"	119
Fire clay, grayish.....	5	124
Concealed to top of Homewood sandstone, 535'		
A. T. B.....	40	164

A sample of the bed of fire clay at 119-124 feet was collected from the property of Frank Yates, and an analysis made of same in the laboratory of the West Virginia Geological Survey by Mr. J. B. Krak, Assistant Chemist, which gave the following result:

Frank Yates Fire Clay, Ft. Gay, Wayne County.

	Per cent.
Silica (Si O_2).....	71.93
Ferric Iron (Fe_2O_3).....	1.49
Alumina (Al_2O_3).....	17.06
Lime (Ca O).....	0.31
Magnesia (Mg O).....	0.37
Sodium (Na_2O).....	0.72
Potassium (K_2O).....	1.90
Titanium (Ti O_2).....	0.55
Phosphoric Acid (P_2O_5).....	0.01
Moisture	2.00
Loss on ignition.....	4.31
Total	100.65

This bed of clay continues along Mill creek in Butler district, Wayne county, and appears to be from 4 to 5 feet thick.

Not much prospecting has yet been done on this bed, but from the foregoing analysis the indications are that this is a valuable bed of clay and is of some commercial value.

RECENT CLAYS.

The recent clays occur in the flood plains of rivers and small streams. These flood plain clays are uncertain in their distribution in the valleys of larger streams and there are no means of indicating where they are most likely to occur. They usually range in thickness from 1 to 15 feet. These deposits occur along the valley of the Big Sandy and the Ohio rivers, but very little prospecting has been done in these clays.

TEAYS VALLEY CLAYS.

The abandonment by the Kanawha river of its original channel through Teays Valley has left many valuable beds of

plastic clay throughout Cabell county. These clays have been mined at Milton and Culloden. Prof. G. P. Grimsley in Volume III, pages 264 and 266, West Virginia Geological Survey, gives the following in regard to these clays:

Culloden and Milton, Cabell County.

"W. H. McAllister Brick Works, located at east end of the town of Culloden was started in 1896. The equipment includes a Horton soft mud machine, thirteen rack pallet drying sheds, each with a capacity of 3,600 brick, two up-draft kilns holding 150,000 to 260,000 brick, three twenty-foot round down-draft kilns for drain tile. Coal fuel is used and the color of brick and tile is light red.

"Clay Pits.—To the east of the plant is a fine-grained banded clay exposed to a depth of twelve feet in the pit and represents the Teays Valley clay of indirect glacial origin. This clay is used at the plant for drain tile. To the west of the plant is a large acreage of buff, sandy clay used for brick. The clay has a similar appearance to the other river clays of this region as worked farther west at Milton.

"Heck & Sons' Brick Company.—This plant is located at the east edge of the town of Milton, four miles west of Culloden, on the Chesapeake & Ohio Railroad. It was started as the Kane yard about 1890 and has been operated by the present Company since 1901.

"The clay is tempered and molded in a Wellington soft mud machine of 20,000 capacity. The brick are dried in an eleven-track hot air tunnel drier holding 45,000 brick, which are placed in three sixteen-arch up-draft kilns holding 350,000 to 450,000, and burned with gas. The clay used is a river clay, sandy in character. A section of the pit shows eight feet of yellow clay with three feet of blue clay below, and burns to a deep red color.

"Chemical Analyses.—The banded Teays clay from Culloden and the buff sandy clay from Milton have the following composition:

	Culloden clay. Per cent.	Milton clay. Per cent.
Silica	52.89	68.94
Alumina	26.56	15.13
Ferric Iron.....	4.95	2.90
Ferrous Iron.....	0.59	1.35
Magnesium	1.38	0.95
Lime	0.48	0.80
Sodium	0.20	0.96
Potassium	3.12	2.24
Water	1.93	1.00
Titanium	1.00	0.93
Phosphorus	Trace	Trace
Loss on ignition.....	7.34	5.31
Totals	100.44	100.51

Mechanical Analyses.

	Range in Millimeters.	Culloden.	Milton.
Fine clay.....	0.00 to .001	39.6	12.05
Coarse clay.....	0.001 to .005	23.0	13.00
Silt	0.005 to .02	31.0	36.90
Fine sand.....	0.02 to .15	2.0	25.65
Coarse sand.....	0.15 to 5.00	2.4	11.40 (to 3.00)
Water		2.0	1.00

"The brick at Milton yards are deeper red than the drain tile at Culloden on account of higher temperature of burning as the iron percentage is higher at Culloden. The sandy character of the Milton clay is shown by these analyses.

"**Physical Properties.**—The Culloden clay slakes in five minutes and the Milton in one-half minute. The former clay requires 30 per cent of water to develop a normal molding consistency and the latter 23 per cent. The maximum plasticity of the Culloden clay is 7 and its air shrinkage is 8 per cent, while the Milton clay reaches 19, and has a shrinkage of $4\frac{1}{2}$ per cent. The tensile strength of the Milton clay is 120 pounds with a maximum of 165, and in the Culloden clay is 170 pounds with a maximum of 182 pounds to the square inch.

"The Culloden clay, which is typical of the Teays Valley clays, becomes nearly steel hard at cone 05 (1922° F.). Incipient fusion begins at cone 1 (2102° F.) and vitrification is complete at cone 5 (2246° F.). The color changes from red to black on vitrification and the fire shrinkage is $15\frac{1}{2}$ per cent.

"The Milton clay shows no change at cone 05 (1922° F.) with incipient vitrification at cone 1 (2102° F.) and complete vitrification at cone 5 (2246° F.). Its fire shrinkage is only 1 per cent.

The Barboursville Clay Manufacturing Company.

The Barboursville Clay Manufacturing Co., successors to the Guyan Valley Brick Co., is located at Barboursville, eight miles east of Huntington, W. Va., and is operating in a thick deposit of gray sandy shale from 10 to 30 feet thick, lying beneath the Morgantown sandstone. This horizon would correspond to the Birmingham shale. This plant was first built in 1904, and the new company was incorporated in 1911. "The equipment consists of a steel disintegrator, two Frost nine-foot dry pans, ten-foot pug mill, and a Steele & Company auger machine of 70,000 brick capacity in ten hours. The brick are dried in two five-track National steam driers holding 85 cars with capacity of 54,000 brick. When the plant is fully completed it will have eight down-draft kilns, thirty feet in diameter, holding 70,000 brick each, and six up-draft kilns 70 feet long, holding 400,000 brick.

"**Shale Pit.**—Near the plant is a large acreage of sandy river clay which is opened 20 feet in depth and a boring shows to be 38 feet deep. This clay makes a very good grade of red building brick, which will be burned in the up-draft kilns."

The following is the chemical analysis given in Volume III of the West Virginia Geological Survey, page 245.

"**Chemical Analysis.**—The buff shales from this locality have the following composition:

	Per cent.
Silica	53.03
Alumina	22.14
Ferric Iron.....	7.12
Ferrous Iron.....	1.26
Magnesium	1.57
Lime	1.01
Sodium	0.29
Potassium	3.59
Water	1.94
Titanium	0.66
Phosphorus	0.79
Loss on ignition.....	6.56

Total99.96

A rational analysis gives:

	Per cent.
Free silica.....	7.96
Feldspar	27.25
Clay substance.....	64.79

"The shale is high in ferric iron and low in lime, so would burn to a good red color. The proportion of fluxes is 14.84 per cent, very similar to the shales near Huntington.

"Physical Properties.—The shale slakes very slowly and requires 25 per cent of water to develop a normal molding consistency; the maximum plasticity is 15, and the air shrinkage $5\frac{1}{2}$ per cent. The tensile strength is 96 pounds with a maximum of 105 and when weathered, the tensile strength reaches 155 pounds.

"Incipient fusion occurs at cone 05 (1922° F.), vitrification at cone 1 (2102° F.), completed at cone 5 (2246° F.) with 2 per cent fire shrinkage."

These shales are exposed east of Barboursville, along the C. & O. Railway cut at Ona. Just west of the station the following section was once measured by Prof. G. P. Grimsley and published in Volume III, West Virginia Geological Survey:

Ona Section.

	Feet.
Sandstone	5+
Buff shale with some blue shale.....	25
Sandstone	3
Buff shales to C. & O. track.....	10

"In the cut one-half mile east of the station the following strata occur:

	Feet.
Buff shales.....	12
Blue clay.....	1—2
Buff shales, compact.....	2
Buff shales, with some blue shales.....	15

"These shales may be observed in a number of cuts in this region and have a large surface extent. Small iron concretions occur in the lower shales in the west cut.

"**Chemical Analyses.**—The shales were sampled from the cuts east and west of Ona Station and show the following composition:

	West Cut. Per cent.	East Cut. Per cent.
Silica	48.00	52.11
Alumina	25.29	23.92
Ferric Iron.....	5.34	5.28
Ferrous Iron.....	3.62	3.00
Magnesium	2.06	2.14
Lime	2.33	0.36
Sodium	0.26	0.29
Potassium	3.31	2.80
Water	1.60	1.61
Titanium	0.72	0.64
Phosphorus	0.32	0.47
Loss on ignition.....	7.41	6.91
Totals	100.26	99.53

"The shale has not changed much in composition in a half mile. The percentage of lime is higher in the west cut. The percentage of ferric iron should give the burned clay a good red color. When compared with the Barbourville and Huntington shales, it is seen that all these shales are quite similar. The percentage of fluxes in these two shales is 16.92 and 13.87.

"**Physical Properties.**—These shales slake very slowly and require about 25 per cent of water to develop their normal molding consistency. The maximum plasticity of the shale in the west cut is 16 and in the east cut 11. The air shrinkage of both shales is about 6 per cent. The tensile strength of the shale in the west cut is 126 pounds with a maximum of 130, and when weathered reaches 168 pounds. The other shale has a tensile strength of 94 pounds and a maximum of 116 pounds, and when weathered reaches 134 pounds to the square inch.

"In the west cut shale incipient fusion is reached at cone 05 (1922° F.), vitrification occurs from cones 1 to 5 (2102° F. to 2246° F.) with practically no shrinkage. In the shale from east cut there is no trace of fusion at cone 05 (1922° F.), but vitrification begins at cone 1 (2102° F.) with 11 per cent fire shrinkage."

ROAD MATERIAL.

The Cabell-Wayne-Lincoln area contains very little limestone, so it will be necessary to look to other material than limestone for road building material.

The roads of this area are made entirely of dirt. Even the old turnpikes were never anything else. These become

almost impassable during the Winter season. Therefore, the subject of road materials is of vital interest to the citizens of this portion of the State. Cabell county has recently voted a bond issue of \$300,000 to build roads in Guyandot and Barboursville districts from Huntington east and north.

The Elk Lick, the Ames and the Brush Creek limestones have already been described in this volume, but are too thin to be of much value for road building purposes.

Gravel Pits.

Probably the best road building material within the area is the gravel in the terraces along the Ohio, Guyandot and Big Sandy rivers and their tributaries. Also the gravel and hard materials found in the beds of the creeks and small streams. This material consists of small and coarse boulders and gravel, and when it is thoroughly packed in the roads makes fairly good road material.

BUILDING STONE.

Prof. G. P. Grimsley gives a discussion of the building stones of West Virginia in Volume IV of the West Virginia Geological Survey, with an account of their origin, physical and chemical properties, and their uses, to which the reader is referred.

The following sandstones outcrop in the Cabell-Wayne-Lincoln area:

Dunkard Series.

Waynesburg Sandstone	Description given on page 83.
----------------------	-------------------------------

Monongahela Series.

Gilboy Sandstone	Description given on page 96.
Uniontown Sandstone	Description given on page 97.
Arnoldsburg Sandstone	Description given on page 97.
Upper Pittsburgh Sandstone	Description given on page 98.

Conemaugh Series.

Lower Pittsburgh Sandstone	Description given on page 118.
Connellsville Sandstone	Description given on page 121.
Morgantown Sandstone	Description given on page 123.
Grafton Sandstone	Description given on page 129.
Saltsburg Sandstone	Description given on page 135.
Buffalo Sandstone	Description given on page 138.
Mahoning Sandstone	Description given on page 141.

Allegheny Series.

Upper Freeport Sandstone	Description given on page 179.
Lower Freeport Sandstone	Description given on page 182.
East Lynn Sandstone	Description given on page 183.

Pottsville Series (Upper Kanawha Group).

Homewood Sandstone	Description given on page 233.
Coalburg Sandstone	Description given on page 255.
Upper Winifrede Sandstone	Description given on page 260.
Lower Winifrede Sandstone	Description given on page 269.

Pottsville Series (Lower Kanawha Group).

Malden Sandstone	Description given on page 272.
------------------	--------------------------------

SALT WATER.

The Big Injun sandstone in the Parkersburg syncline throughout Cabell county contains large quantities of salt water, wherever it has been pierced with the drill in prospecting for oil and gas.

A sample of this salt water was taken from the Virginia Morrison well (C-133) and an analysis made in the laboratory of the West Virginia Geological Survey by Mr. J. B. Krak, Assistant Chemist, showed that the water from this well contained 17.17 per cent of Sodium Chloride, or common salt. This is a very good water for the manufacture of salt, since water at 60° temperature (Fahr.) when fully saturated contains only 26 per cent of salt.

CHAPTER XIII.

DESCRIPTION AND HISTORY OF THE TIMBER IN THE CABELL-WAYNE- LINCOLN AREA.

Mr. A. B. Brooks, Forester, in Volume V of the West Virginia Geological Survey has published a description of the timber conditions in the different counties of the State. He gives the following interesting description of Cabell county on page 122 of the volume in question.

CABELL COUNTY.

Original Forest Conditions.

The original forest has disappeared. Old residents state that there was once a heavy growth of hardwoods, such as oaks, yellow poplar, hickory, ash, cucumber, beech and maple, and a little yellow pine in the hills. The location of the county and the adaptability of its soil for tree growth warrant such a statement.

Destruction of Timber by Early Settlers.

Much of the best timber was destroyed in the "clearings" of the early settlers, who came in considerable numbers into the valley of the Ohio and its tributaries in the county as early as 1800. The best land, where the best timber grew, was taken first and all the valuable timber, except a small amount for domestic use, was rolled together in heaps and burned.

The Lumber Industry.

The first timber removed from the county for commercial purposes was rafted down the Ohio river. This industry began about 70 years ago. Rafting was not carried on to any considerable extent by large companies, but chiefly by owners of small tracts of woodland. Many men were thus employed during the winter months. Timber sold at a low price then and nothing more was expected in return by those who engaged in this winter occupation than pay for their labor. The rafts of logs were sold to saw mill operators along

the Ohio river as far down as Cincinnati and Louisville and to timber dealers. Among the latter were Vinson, Goble & Pritchard, who bought rafts at the mouth of the Guyandot river. It is said that the county furnished not less than 50 per cent of the white oak timber used in building steamboats from Huntington to Louisville. The timber thus used was rafted to mills outside the State and manufactured there.

There were but few saw mills before 1860. A small number of water-power and steam mills sawed for local use. In about 1870, however, near the time of the building of the Chesapeake & Ohio railroad, several portable steam mills were put in operation. Some of these have continued to run, often with indifferent success, to the present time, and have cut about all the timber that was not floated out at an earlier date. The principal shipping points have been Milton, Ona, Barboursville, Huntington and Guyandotte.

Three of the largest saw mill operators during the early years of the industry were the Ensign Manufacturing Company, 1871, and the Lyons Stave Company, 1871, of Huntington, and Wilson & Lyons, of Guyandotte.

The Present Timber Conditions.

There is no virgin or cutover forest land left in the county and nearly all the merchantable timber has been removed from the farmers' woodlots. The second growth has been cut over time after time and the crosstie timber, even, is no longer to be found except in small quantities.

The woodlot area has been greatly reduced during the past few years to make room for the culture of tobacco, and some of the upland has been cleared for apple orchards.

The following is a description given by A. B. Brooks, Forester, in Volume V, pages 177-179 of the West Virginia Geological Survey, concerning the timber in Lincoln county:

LINCOLN COUNTY.

The Original Forests.

The leading timbers were yellow poplar, black walnut, white ash, black cherry, and white oak, red oak and chestnut oak. Other less valuable but plentiful timbers were beech, maples, hickories, birches, black gum, white elm, sycamore and others. There was a fairly good growth of hemlock in favorable localities throughout the county.

The Lumber Industry.

It may be stated that here, as in many of the other counties, there was a large but necessary destruction of fine timber in the clearings of the early settlers. The period of such destruction in Lincoln began about 1820 and lasted, approximately, for 50 years. The first farmers who occupied the northern and northeastern sections

of the county, principally along the water courses of Guyandot, Mud and Coal rivers, destroyed much valuable timber which could not be used for domestic purposes and which had no commercial value at that time and place. The poplars, walnuts and oaks grew to such a size that the early settlers found it difficult to clear their lands of them. The chief uses that could be made of timber in those days was in the construction of log dwellings and outbuildings and for fencing. The first lumber was sawed with whip saws operated by hand. A little later a few water-power saw mills were built along the streams. One of these was operated by Charles Latin on the Mud river, near the town of Hamlin, and another by David Porter, nine miles below.

In 1872, floating began on the Guyandot and Mud rivers. The first men to engage in this industry were Blankenship and Hoback, who bought poplar timber near the Guyandot and Mud rivers. The trees that stood near enough were felled into the stream beds during the summer and fall, when the water was very low, and there cut into logs and left to await a freshet. Other logs were cut on the adjacent hill sides and hauled by oxen to the streams. Buying and floating was continued for about 30 years. Three of the most extensive operators are named below:

Prichard & Lewis, the largest floaters on the Guyandot, built dams on many of the tributaries of that river and "splashed" out the logs to the main stream. They operated from 1885 to 1895.

Alexander Henderson floated out large numbers of logs to the Ohio river during the years from 1895 to 1897.

Fulton Cummings rafted timber on the Mud river from 1890 to 1900.

It has been the custom of owners of small tracts of timberland for about 30 years to raft their own timber to Guyandotte and Huntington, where ready sale could be made to operators and timber dealers. The chief stave industry was conducted on the Mud river from 1880 to 1884. The methods employed were very wasteful, as the best only of each tree cut was utilized.

Steam saw mills were introduced in 1880, being hauled in on wagons in that and succeeding years and placed at several of the more easily accessible points in the county. The lumber manufactured at first on these mills were rafted down the rivers and later was taken in boats. With the building of the railroads—the Guyandot Valley Branch, in 1900, and the Coal River Branch, in 1906—a large number of portable mills began operation. Many of these are still sawing. No stationary mills with great capacity have operated in the county.

The Present Forest Conditions.

The largest tract of virgin timber in the county lies on the headwaters of Mud river, along the Boone county line. A few miles farther north, on the waters of Coal river, there is another tract of smaller size. The two tracts, containing about 7,000 acres, comprise the virgin area in this county. The cut-over forests occupy an area of about 52,000 acres in the southern, south-central and eastern parts of the county. The best timber has been taken from the farmers' wood lots, but there is still left a good stand of small oaks, beeches, maples, birches, etc.

About 15 per cent of the county is unfit for agriculture. In recent years, however, a large number of acres of the rougher upland has been cleared for grazing purposes and for tobacco growing.

The following is given by A. B. Brooks, Forester, on pages 301-303 of Volume V, West Virginia Geological Survey, in regard to timber in Wayne county:

WAYNE COUNTY.

The Original Forests.

The virgin forests have practically disappeared from Wayne, making it difficult to determine from present conditions the character of the original areas. There is, however, an authentic timber record of a large tract on the Right fork of Twelvepole which may be taken as typical of the virgin forests of the county. The trees that were measured on this 12,263-acre tract were those above 18 inches in diameter four feet from the ground, with the exception of locusts, hickories and black walnuts, which were measured from a diameter of 10 inches and upward. The varieties and numbers of commercial timber trees growing on the tract at that time are as follows:

White Oaks	24,760
Chestnut Oaks	38,848
Hickories	21,298
Black Oaks.....	8,528
Yellow Poplars	12,450
Basswoods	2,328
Chestnuts	7,681
Locusts	1,996
White Maples (Red Maples).....	1,583
Sugar Maples	450
Birches	1,344
Black Gums	1,044
Black Walnuts	393
Red Oaks	943
Cucumbers	240
Ashes	271
Buckeyes	28
Sycamores	13
Pines (probably Pitch Pines).....	3,472
Hemlocks	903

Whole number of trees.....128,567

There was but little hemlock on the Big Sandy and on the lower half of Twelvepole and none on the Ohio river. There was a scattered growth of pitch and Jersey pine and red cedar. Cedars grew, and are still growing, most abundantly in two belts of land which extend across the county from east to west, one about 2 miles wide passing through the center, and another about one mile wide seven miles north of this.

The Lumber Industry.

The timber of the county has been cut; first, by the early settlers, who used a little and destroyed much; second, by farmers and lumbermen, who drifted and rafted logs on the Big Sandy river and on Twelvepole creek; and third, by operators of saw mills in the county. A large number of logs were cut by the owners of small tracts of land and rafted to the Ohio river, where they were bought by lumber companies and taken in fleets to southern points. In later years C. Crane & Co., of Cincinnati, and other companies, bought stumpage along the streams and rafted out their logs.

From 1875 to 1884 many split staves were cut and delivered to the banks of the streams, to Oxley Stave Company of Cincinnati and to Dixon & Barr. These companies drifted the staves to the mouth of Twelvepole, where they were caught in a boom and loaded into barges. Much of the best oak in the county was used and much was wasted in the stave industry.

The pioneer saw mill operators were the Smiths, who came from Virginia about 1832 and built water-power mills along Twelvepole creek. A part of the lumber manufactured by them was used locally and a part floated in "stacks" down the Twelvepole. Saw mills were few and of small capacity until the building of the railroads.

C. W. Ferguson has operated a circular and planing mill, known as "Elmwood Mill," for many years on Twelvepole creek near the town of Wayne. Most of the lumber used in constructing the buildings of Wayne, the present county seat, was sawed on this mill.

Among the larger companies that have operated in the county are the Prendergast Lumber Company, which cut timber from the East Fork of Twelvepole and from tributaries of Tug Fork; Al. Cline Lumber Co., which cut timber on Tug Fork waters, and the Parsons Lumber Company, which cut poplar into cigar box stock and thin ceiling at Ceredo.

McComas, Bowen & Co. operated mills in various sections of the county, cutting the best of the hickory for handle stock. The cross-tie industry has been large since the coming of the first portable mills.

The timber has been cut to such an extent that the lumber industry is no longer large. Rafting still continues, in a small way, along the Tug Fork and the Twelvepole. About 18 portable mills are sawing from place to place.

The Present Forest Conditions.

The timberland is in Lincoln and Grant districts in the southeastern part of the county. In these two districts fully one-half of the surface is owned by non-residents, the other half, or less, being owned and occupied by farmers. There are about 3,600 acres of virgin forest scattered in small tracts throughout the central and southeastern sections and 80,000 acres of cut-over forest. The whole northwestern end of the county is owned by farmers.

The cut-over forest land still has from 25 to 40 per cent of the original timber, and the farmers' wood lots, especially in the southeast, contain a good stand of the less valuable hardwoods.

CHAPTER XIV.

COOPERATIVE SOIL SURVEY, AND REPORT

The West Virginia Geological Survey cooperates with the U. S. Department of Agriculture's Bureau of Soils in the study, classification, and mapping of the soils in each area covered by its geological reports. The Reports and maps of the soil experts of the U. S. Bureau of Soils are published separately by the Department of Agriculture, and the same Reports and soil maps are then republished as an integral portion of each volume of our Detailed County Reports.

The republished soil maps of Cabell, Wayne and Lincoln counties will be found in the case of soil, topographic, and geologic maps which accompany this volume, and Mr. W. J. Latimer's interesting and valuable Soil Report covering the same three counties, and known as the Huntington area, follows herewith (I. C. W.)

SOIL SURVEY OF THE HUNTINGTON AREA, WEST VIRGINIA.

By W. J. LATIMER.

DESCRIPTION OF THE AREA.

The Huntington area lies in the extreme southwestern corner of West Virginia, bordering the Ohio and Big Sandy rivers. It includes Cabell, Lincoln and Wayne Counties and has an area of 1,255 square miles, or 803,200 acres. It is bounded on the north by the Ohio river and Mason county, on the east by Putnam, Kanawha and Boone counties, on the south by Logan and Mingo counties, and on the west by the Big Sandy river.

Physiographically the area lies wholly within the Appalachian plateau. Very little of the original surface is left, having been dissected by numerous streams that have reduced the ridges to narrow hogbacks. The valleys are usually narrow and the walls steep. The tops of the hills or ridges when viewed from a distance present a generally level appearance. The general elevation over the northern two-thirds of the area is from 1,000 to 1,200 feet, and in the southern part it ranges from 1,200 to 1,800 feet. The lowest point in the area is at the junction of the Ohio and Big Sandy rivers, where the elevation is about 490 feet above sea level. Many of the hills in the extreme southern part of the area rise above 1,800 feet.

In general, the hilltops of the country lying back from the Ohio river are from 250 to 350 feet above stream level, and along the southern boundary of the area from 350 to 500 feet above stream level. Between these points the rise is very gradual until the southern part of the area is reached.

The topography of the area is generally rough, though the hills in the northern and central parts of the area are more rounded and the hillsides less precipitous. The valleys of the larger streams vary from one-half to one mile in width. Over most of the area the bottom lands are very narrow. Many more or less eroded ancient stream terraces are found, which modify the topography to some extent. Teays valley, ¹ the bed of the ancient Kanawha river, is the most prominent of these old deposits. (See Pl. I, figs. 1 and 2.) It extends from St. Albans to Huntington and forms a very marked feature of the area.

The greater part of the area is drained by two stream systems, the divide consisting of a ridge that begins at Huntington and runs in a general north and south direction, forming the Lincoln and Wayne county line. To the east of this line, with the exception of a narrow strip on the east side of the area that drains through local streams into Little Coal river and a restricted section of country along the northern boundary that is drained into the Ohio river, the drainage is carried off by the Guyandot river and its main tributary, Mud river. To the west of this line the drainage, with the exception of a narrow strip extending along the southwest border of the area, drained by small lateral streams into the Big Sandy river, is through Twelvepole creek. The drainage of the entire area ultimately finds its way into the Ohio river.

¹See U. S. Geol. Survey, Charleston and Huntington folios.

Prior to 1800 very few settlements were made in the area, but from that time until 1830 large numbers of settlers entered from Virginia and the Carolinas. Others came down the Ohio from Maryland and Pennsylvania, but these were comparatively few in number.

The building of the James river and Guyandot turnpike, which was completed in 1830, gave a great impetus to the growth of the area. About this time navigation was opened on the Ohio river and lumbering operations in the interior of the area gave employment to large numbers. The building of the Chesapeake & Ohio railroad in 1872 served to open up trade with the eastern markets, and the shipping of stock and lumber became important. The Ohio River railroad, now a part of the Baltimore & Ohio system, was completed in 1891 and gave quicker transportation to northern points. The Norfolk & Western railroad, built in 1892, and the Big Sandy River extension in 1906, the Guyandotte Valley railroad, built in 1902-3, and the Little Coal River railroad, built in 1906-7, both branches of the Chesapeake & Ohio, were all promoted in the interest of the coal and lumber industries.

Upon the opening of the railroads to the west and the subsequent development of that country many people left the area and moved west. Large numbers have come into the area since the oil, gas and coal deposits have been exploited. Most of them have come from the adjoining states of Ohio, Kentucky and Pennsylvania.

Large numbers of slaves were owned in Teays valley and along the Ohio and Big Sandy river bottoms, but very few negroes are found in the area to-day, except in the larger towns, and many of these have come from adjoining Southern States.

The majority of the farming population of the area are descendants of the original settlers.

Cabell county was formed from Kanawha county in 1809, Wayne from Cabell in 1842, and Lincoln from parts of Cabell, Putnam, Kanawha and Boone counties in 1867.

Coal was first mined at Branchland in 1854 and later at Hubbards-town, but these operations were brought to a close with the beginning of the Civil War. The later developments have come with the building of the railroads and the introduction of eastern capital.

Oil and gas were discovered in paying quantities near Milton about 1901 or 1902. Since that time the development has been rapid. One of the largest producing oil fields in the State is located near Griffithsville. Gas is found in large quantities, but the development is scattered.

The timber industry has dwindled considerably from its former proportions, although large areas of original forest are still found in the southern part of the area, and much desirable timber is still available in the cut-over areas of this section and also in the woodlots in other parts of the area from which the original growth has long since disappeared.

Huntington, the principal town of the area, was founded upon the completion of the Chesapeake & Ohio railroad to the Ohio river and, according to the census of 1910, has a population of 31,161. It is well supplied with transportation facilities, both rail and water. The manufacturing enterprises are many and varied, covering the range of nearly all classes of goods used in this section of the country. Fuel is cheap, and natural gas can be had at a low price.

Kenova, the second city in the area, is a thriving manufacturing center, located at the confluence of the Ohio and Big Sandy rivers.

It has excellent railroad facilities and is connected with Huntington by a trolley line. Ceredo is a small town between Huntington and Kenova. Wayne, the county seat of Wayne county, and Hamlin, the county seat of Lincoln county, are small but thriving towns. The latter is near the Griffithsville oil fields. Both towns are located in a good agricultural country. Barboursville and Milton are situated on the Chesapeake & Ohio railroad and are the distributing points of good farming sections, the latter being an important tobacco market. Branchland is a small town on the Guyandot Valley railroad, built by the gas and coal industry. Fort Gay is a small town on the Norfolk & Western, opposite Louisa, Ky., on the Big Sandy river. McCorkle is a distributing point for the oil fields, located on the Little Coal River railroad.

The area is well supplied with transportation facilities. The Chesapeake & Ohio railroad, double tracked, gives direct connection with points east, west and north; the Baltimore & Ohio (Ohio River Division) with the northern points, and the Norfolk & Western with the South. The smaller branch roads cover nearly all parts of the area, facilitating the distribution of supplies and the collection of products. The Ohio river, during most of the year, is open to navigation and will be available during the entire year after the completion of the system of locks and dams now in course of construction. The smaller streams, while navigable only for small craft, are used for rafting timber.

The public road system in Cabell county is good, considering the character of the county traversed and the road material at hand. Some of the roads in the other portions of the area are good, but over the greater part they are not in very good condition.

The local markets for produce are good and at the present time are supplied largely from outside sources. Huntington is the best local market, but the oil fields and coal mines also furnish good markets. Pittsburgh, Baltimore and Cincinnati are the principal outside markets for selling the products of the farm and factory and also for buying supplies.

CLIMATE.

The climate of the Huntington area is agreeable and salubrious throughout the entire year. The winters are cold but not severe and are what is usually termed in the North "open winters." The mean temperature for the winter months is 33° F. and the absolute minimum recorded is -26° F. Temperatures below 0° F. are rare. The cold spells are usually of short duration, and long periods of mild weather usually intervene. The summers are hot, but not oppressive, the temperature rarely going over 100° F., the maximum record being 102° F. The hot spells extend over very short periods, and as the nights are usually cool there is very little suffering from heat. Excellent climatic conditions usually prevail during the spring and fall months.

The average date of the last killing frost in spring is April 17 and of the first in fall September 18. This gives an active growing season of approximately six months. The pasturage season lasts about eight months.

The annual precipitation of about 40 inches is fairly well distributed throughout the year, the distribution occurring so that it is of the most benefit to growing crops. The heaviest precipitation comes

in the spring during the active growing season, and usually the rainfall is light during the harvest season. Heavy floods usually occur during early spring, when winter is breaking and the snow is melting. Especially is this true along the Ohio river. Smaller floods occur during the late spring and early summer, usually along the smaller streams. Fall floods are rare, and little loss is incurred from this source. The earlier heavy floods usually come before the growing season starts. The most severe damage is caused by the late spring floods. The snowfall is light during most winters and remains upon the ground but a short time. During some years the fall months, September, October and November, are very dry and pastures suffer for want of moisture. As all the crops mature before that time, dry falls are not a very serious matter to the farmers, and a moderately dry fall is a decided advantage.

The climatic conditions of the area are well suited to general farming, stock raising, dairying, commercial orcharding and truck growing. Tobacco grows well and matures even at the highest elevations within the area.

The following table gives the normal monthly, seasonal and annual temperature and precipitation as recorded by the Weather Bureau station at Point Pleasant:

Normal monthly, seasonal and annual temperature and precipitation at Point Pleasant.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	35	70	— 5	3.1	4.4	2.6	1.6
January	33	73	—14	3.6	1.5	8.0	4.9
February	32	75	—26	3.6	1.3	1.9	5.0
Winter	33	.....	.....	10.3	7.2	12.5	11.5
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
March	45	84	4	3.7	2.4	5.8	5.0
April	55	95	23	3.0	6.9	1.5	0.5
May	66	98	31	3.5	5.8	3.5	0.0
Spring	56	.....	.....	10.2	15.1	10.8	5.5
June	73	102	44	4.8	7.3	2.4	0.0
July	77	102	47	3.7	0.7	2.8	0.0
August	75	99	50	3.2	1.6	6.4	0.0
Summer	75	.....	.....	11.7	9.6	11.6	0.0
September ...	70	100	37	2.2	2.3	2.1	0.0
October	58	90	19	1.9	0.2	3.2	0.0
November	45	81	14	3.2	2.6	2.7	0.5
Fall	58	.....	.....	7.3	5.1	8.0	0.5
Year	56	102	— 26	39.5	37.0	42.9	17.5

AGRICULTURE.

The first real agricultural development of the area came with the tide of immigration during the early part of the last century. These settlers found homes along the Ohio river, tributary stream bottoms, in Teays valley and adjacent hill land. They cleared large areas, burning the timber as the quickest method of removing it from the land. The principal crops grown are corn, wheat, tobacco, potatoes and vegetables.

Much of the supplies produced during the early days was sold to transient homeseekers going farther west. In Teays valley this soon developed into a profitable business, as the valley formed a natural route for travel to and from the East. Many large taverns were established and many acres kept under cultivation to feed the travelers and stock that passed through the valley. This business was brought to a sudden close with the completion of the Chesapeake & Ohio railroad. Along the Ohio river wheat, potatoes and apples were shipped in large quantities by flatboat to New Orleans.

Other portions of the area developed more slowly than did the Ohio River valley and Teays valley. The southern section is still sparsely settled, and over a large part of the area very little attention has been paid to agriculture. Lumbering claimed the attention of a considerable proportion of the population until a few years ago. About the time of the decline of the lumber industry oil and gas were found and the coal deposits began to be exploited. These industries give employment to many persons previously in the lumber camps.

The principal crops produced in the area at the present time are tobacco, corn, wheat, potatoes and hay.

Tobacco has been grown in this area since it was first settled and has gradually gained in production until at the present time it represents the main money crop. The Civil War curtailed the production, and when the war tax was imposed in the early sixties it ceased to be grown on a commercial scale. With the removal of the tax the industry revived and continued to increase until the low prices of the early nineties discouraged the growers and very little planting was done. About 1900 conditions improved and within the last few years the output has increased very rapidly. The present production is estimated to be about 10,000,000 pounds.¹

The Bright Burley, the present variety grown, was introduced in Teays valley about 20 years ago. Before that time the Ochre variety was chiefly grown. This tobacco was fire-cured and the commercial article was heavy and black. Practically all the tobacco grown in the area at the present time is air-cured, and some of it is more or less sun-cured before it is placed upon the racks in the barn. Most of the tobacco produced is very high grade. The color is bright and it has splendid wrapping qualities. Most of the crop is used for plug wrapper and high-grade cigarette and pipe tobacco.

The quality varies considerably with the soil type, the condition of the land and also with the kind of manure and fertilizers used. The sandy soils produce light tobacco of inferior quality and the heavy soil types produce heavy tobacco, usually of good quality. The terrace soils produce the best grades, but fall below the first-bottom lands in yield.

The curing and field method of handling the growing crop have

¹The 1919 estimate made by Huntington Tobacco Warehouse.

much to do with the quality. The method of cultivation of tobacco on the hill land differs considerably from that practiced upon the bottoms and more level land. Here practically all the cultivation is by machinery, while upon the hill land it is done with the hoe. This makes a marked difference in the cost of production.

The following is the generally accepted method of growing tobacco as practiced by many of the best growers: Break the land with a turn plow at first favorable time in April, harrow with smoothing harrow, disk, and harrow again with smoothing harrow. Put in fertilizer with the wheat drill or drop in the hill. When placed in the hill 150 or 200 pounds per acre of 8-2-5 fertilizer is used and when put in with the drill 500 to 600 pounds of the same grade of fertilizer is required. When heavy applications are made wheat is generally planted the following fall. The plants are transferred from the seed beds to the field from the middle of May to the middle of June in rows four feet apart, plants 18 to 24 inches in row, according to quantity of fertilizer applied. A 5-tooth cultivator is used and four or five cultivations given, according to growth of plant or season, starting as close to the plant as possible and making each subsequent cultivation vary in distance from plant as root system and size of plant will permit. Weeding close to plants is usually done with a hoe. Topping varies with the season, from 9 to 16 leaves being left. At the first topping 16 leaves are left, at the second 12, and the last 9 leaves. Crops planted the middle of May under ordinary seasonal conditions should mature about the middle of September. Cutting is started when the leaves become spotted and begin to stiffen. Most of the planters transfer each day's cutting to the barn, while others leave the tobacco in the field for several days if weather conditions are favorable. A few days of sun curing produces a better leaf, but there is too much risk from rains and placing each day's cutting in the barn is considered the safest plan.

The tobacco is not subject to attack by disease or insects to any considerable extent. Paris green is used in sprays or dry for tobacco worms. Tobacco following sod suffers most from insect pests. In the southern part of the area tobacco is planted largely upon new land.

Corn has been produced in steadily increasing quantities since the first settlement of the area. At present it occupies a larger acreage than any other crop, being the most widely distributed crop grown in the area. It is grown principally upon the bottom lands and fertilizer is used to a very limited extent. Manure is used when it can be obtained in sufficient quantities. Corn cutters and binders are used occasionally, though most of the crop is cut and shocked by hand.

Wheat is grown to a very limited extent at the present time and is confined to the terrace soils and fairly level ridge tops. Upon the terrace soils most of the crop is drilled in. Bone meal, about 200 to 300 pounds; ammoniated phosphate, 250 pounds; or acid phosphate, 250 pounds per acre is used. If grass is to follow wheat bone meal is generally used, as it becomes available very slowly.

Oats, rye and barley are grown in small quantities, mostly along the Ohio river terraces and in Teays valley, and are used in rotations.

Under the conditions existing in this area wheat could not be produced to compete with the western product, and oats, rye and barley were grown as substitutes. With the present high prices wheat is grown more extensively than during the last two decades and the other cereal crops have decreased proportionately.

Irish potatoes are grown in limited quantities in all parts of the area, but in commercial quantities only upon the terrace soils and in Teays valley. The crop is sold locally. Spraying is usually done with Bordeaux mixture, Paris green, or arsenate of lead.¹ Where manure can not be secured or a crop turned under the preceding season heavy applications of truckers' fertilizer of an 8-5-7 formula are usually made.

Sweet potatoes are grown to some extent upon the sandy bottom land and terrace soils and give good yields. The potatoes are dry and mealy and well suited to the requirements of the local market.

There is not a great deal of hay produced in the area. Timothy, clover and crabgrass are the principal crops grown for this purpose, timothy being most extensively sown. Considerable forage is secured by growing cowpeas, which do well under the local soil and climatic conditions. Bluegrass comes in naturally upon the Meigs soil and a considerable area of this type is in sod. The natural growth of bluegrass can not be depended upon for a stand. The following method is usually adopted to secure a good sod of bluegrass upon the hill land: The first two years after clearing either corn or tobacco is planted and timothy, clover and bluegrass sown upon the stubble of the last crop. If pasture only is desired the timothy is eliminated and the clover used as a nurse crop for the bluegrass.

Sorghum is grown to some extent upon the bottom land and peanuts and sweet potatoes in a small way mostly upon the sandy soil types. Watermelons and cantaloupes are grown on the sandy areas of the river bottoms and terraces. Broom corn and buckwheat are produced in very small quantities. A few small patches of alfalfa were found leading a rather precarious existence and as yet no great success has attended the growing of this crop.²

Although the soils of the area, especially the terrace soils, are well adapted to growing truck, such, for instance, as potatoes, tomatoes, beans, cabbage and beets, there is very little of these crops produced, the Huntington market being supplied with vegetables from the larger bottoms on the Ohio side of the river. Potatoes are grown more extensively than any of the other truck crops. Sweet corn is grown to some extent in the Ohio river bottoms and on the bordering terraces.

The table following gives the acreage and yield of the leading crops produced in the area by counties, taken from the United States census of 1910.

	Cabell.		Lincoln.		Wayne		Total	
	Acreage.	Yield.	Acreage.	Yield.	Acreage.	Yield.	Acreage.	Yield
Wheat	12,370	110,380	8,176	52,380	8,532	53,770	29,078	216,530
Corn	17,980	392,130	21,915	549,210	34,637	762,640	74,532	1,703,980
Oats	827	10,780	1,724	18,180	1,805	17,490	4,356	46,450
Irish potatoes.....	553	32,829	376	22,987	808	46,833	1,737	102,649
Sweet potatoes.....	139	7,889	143	9,545	311	18,998	593	36,432
Hay ¹	3,839	3,284	1,994	1,552	3,078	2,651	8,911	7,487
Tobacco	897	570,500	1,255	770,040	228	163,390	2,279	1,503,920
Sorghum	256	17,690	407	21,165	361	22,079	1,024	80,734

¹Millet, Hungarian grass, clover, and other tame grasses.

²See Farmers' Bulletin No. 320, Potato Spraying, and No. 407, Treatment of Seed for Scab.

²See Farmers' Bulletin No. 339, which discusses the growing of alfalfa.

Although fruit has been grown in small quantities since the first settlement of the area, it has been only within the last few years that commercial orchards have been planted. The industry has not yet reached the proportions that it has on the corresponding soils on the Ohio side of the river. Apples and peaches form the bulk of the fruit grown. The Ben Davis is the best paying apple produced in this section. It is a prolific bearer and ships well, though in other qualities it is admittedly inferior. The Rome Beauty and York Imperial are the best varieties of apples produced in the area. The Elberta peach seems well adapted to this part of the country and the majority of the trees in commercial orchards are of this variety. Other fruits, such as cherries, plums and pears, are found to do well upon the upland soils, but are planted only in home orchards. Spraying is practiced in some sections.

Live stock has been kept in some parts of the area since the country was first settled, although the industry has never reached the importance that it has in adjoining counties to the north, where it represents one of the leading industries. Cattle and sheep were raised in commercial quantities during the early forties. Before the days of the railroads the stock was driven overland to Richmond and Baltimore. There are in all probability more cattle in the area to-day than at any time in its history, but the number of sheep has decreased since 1890, owing to the low price of wool. Cattle and hogs have taken the place of sheep upon the farm and under present conditions are more profitable. The cattle kept have largely been grade stock. Most of those in the area at the present time have more or less Shorthorn blood, a breed that was introduced just after the Civil War. Hereford cattle were introduced near Wayne about five years ago and have not as yet had time to come into general use. The success of the Herefords as a beef cattle in other sections of this State points to the rapid adoption of this breed in this section. Of sheep the Southdown, Shropshire and Delaines seem to be the breeds best suited to this section. They were introduced some years ago, but have become mixed with native grades and in most cases have lost their identity. Many good dairy herds are found in the area, consisting largely of grade Jersey and Holstein blood. In Teays valley some attention is given to the breeding of horses. In nearly all parts of the area a few horses are raised, but most of those used even upon the farms are brought from other States. Hogs are kept in small numbers on nearly all farms. The Chester White seems to predominate in the country adjacent to the Ohio river, while in the rougher sections of the area hogs of nondescript breed are most common. Farm management along the Ohio river and in Teays valley differs greatly from that practiced on the hill land, and the farm practice in the southern part of the area differs from that found in the northern two-thirds or over the section where the Meigs soils prevail.

Upon the valley farms, that is, the first and second bottom lands, improved implements, such as cultivators, sulky plows, disk harrows, grain and fertilizer drills, and spraying apparatus for potatoes, fruit and tobacco are used extensively, while upon the hill land the work is done by more primitive methods. In the hill country rapid strides are being made in transportation facilities. Gravity trams are being used extensively for transporting tobacco and other crops from the steep hillsides to the barns in the valley below, the cable being transferred to any part of the hillside from which the crop is being gathered.

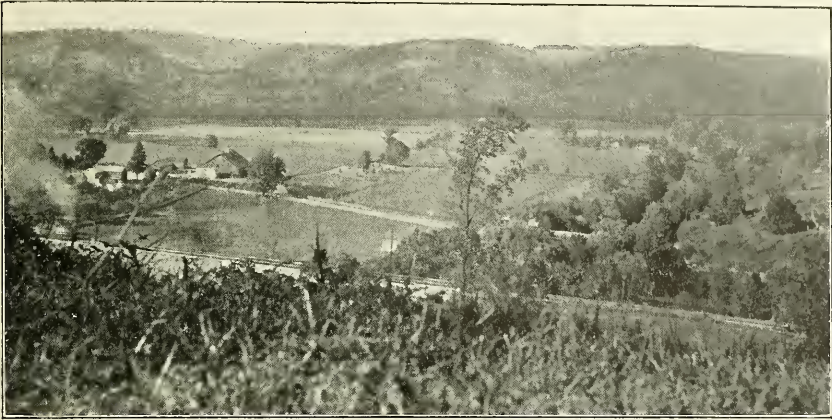


FIG. 1.—Teays Valley, near Milton.
(Meigs clay loam in background uplands on north side of valley.)



FIG. 2.—A Characteristic View of Teays Valley, Looking East
from Point near Milton.

This novel means of moving the crops eliminates the use of teams and wagons, which formed an expensive item in moving the crops from the high hills. While tobacco forms the nucleus of the crops produced on nearly every farm in the area, the other crops grown differ greatly.

Farming along the Ohio river and in Teays valley is more diversified than in other parts of the area. Rotations are used and methods of building up the soil are practiced to some extent. Upon the hill land in the northern part of the area tobacco, with a few other cultivated crops, such as corn, wheat and potatoes, is grown. Most of the land is under bluegrass sod, and considerable live stock is kept. In the rougher sections of the area there are very few cattle. Corn, tobacco and a few vegetables constitute the main crops grown. New land is cleared for tobacco and this takes the place of rotations.

The adaptation of certain soils to certain crops is recognized in some sections. Corn is usually planted extensively upon the bottom land soils. The Meigs soils are known to be well suited to bluegrass and to fruit. Potatoes are grown extensively upon the Wheeling soils and melons on the sandier terraces and bottom-land types. Wheat is grown mostly upon the red ridge tops. Many crops are grown on all soils without regard to their natural adaptation or whether some other crop might give better returns. Tobacco is produced with more or less success upon every soil type in the area. On some the yield is heavy and the grade only medium and on others both yield and grade are poor. Peanuts and sweet potatoes are well suited to the sandy bottom lands and are grown almost exclusively upon these types. There are many soil types in the area that are well adapted to the growing of crops that are not produced at present or are grown to a very limited extent.

The rotations practiced vary considerably with the location and principal use of the land. Upon the terrace soils of the Ohio river a rotation in common use is (1) corn with cowpeas, soy beans, or crimson clover; (2) corn (in some cases tobacco), wheat following tobacco with (3) timothy and clover. If the rotation is to be repeated the clover is sown without the timothy and the clover turned under. In this case cowpeas are usually sown even in the first year of the repeated rotation. Rotations are usually not followed upon the overflow land. Upon the light sandy bottom land and terrace soils a rotation of cowpeas with watermelons is found advantageous, the cowpeas furnishing the nitrogen for the melons. This rotation, however, is not in general practice, but is recommended to all melon growers. Rotations for getting land in condition for mowing are as follows: On hill land, corn with red clover and timothy; on crests of ridges or hilltops, corn, wheat, with timothy and red clover. If pasture is desired bluegrass seed is sown instead of timothy. Where tobacco is the principal crop desired it is grown for two years and the third year wheat and clover, turning under the clover the second year and repeating. Sod and hay can be obtained by sowing in the one case bluegrass or in the other timothy with the wheat.

The fertilizers and rates of application most commonly used in the area are: For tobacco, 400 to 600 pounds per acre of an 8-2-5 mixture of phosphoric acid, nitrate of soda and kainit; for wheat, 150 to 300 pounds per acre of bone meal, 16 per cent acid phosphate, or ammoniated phosphate and nitrate of soda in the ratio of 14-2. Very little nitrate of soda or potash is used alone. Stable manure is used when it can be secured. Leguminous crops are grown to furnish nitrogen

by a few farmers. Crushed limestone and ground phosphate rock (floats) are applied to some extent. A trucker's fertilizer of 8-5-7 formula is used to a limited extent for truck and garden crops. The home mixing of fertilizers would be found a great advantage.¹

The labor available for farm work is usually efficient but scarce. Much of the labor from the farms has been attracted to the oil, gas and coal fields. The wages paid labor upon the farms ranges from 75 cents to \$1 a day. The wages for the same class of labor in other industrial lines is about \$1.25 to \$2 a day, but the work, if not harder, is more dangerous than farm work. Land leases are based largely upon the character of the land and crops to be grown. Tobacco is usually a stipulated crop. Where the owner furnishes the land and work stock and the tenant, the labor, seed and fertilizer, the owner receives one-fourth of the crop upon hill land and one-third of the crop upon bottom land. Rents, where no special crop is stipulated, are usually one-half of the crop when the owner furnishes teams, tools and land and the tenant furnishes seed and labor. Upon bottom land the owner gets one-half of the crop (corn and hay) and furnishes the land only. These are only general statements. Rentals are usually adjusted to suit conditions and vary with the contracting parties.

The land in the northern two-thirds of the area is divided into small holdings, but in the southern part of the area the holdings are more extensive and a large proportion of the land is owned by non-residents. The average size of farms for the area is 83 acres, the figures by counties being: Cabell, 78 acres; Lincoln, 76.5 acres; Wayne, 94.6 acres. The proportion of farms operated by owners is: Cabell county, 62.2 per cent; Lincoln county, 62.6 per cent, and Wayne county, 53.6 per cent. In the area as a whole it is 59.8 per cent.

The following table gives the value of farm lands, implements, etc.:

Item.	Year.	Cabell County.	Lincoln County.	Wayne County.	Huntington area.
Total acres in farms.....	1880	135,693	142,916	241,170	519,779
	1890	131,126	161,489	225,941	518,556
	1900	148,387	184,665	301,602	634,654
	1910	149,512	191,862	240,753	582,127
Acres improved.....	1880	47,577	36,493	75,745	159,815
	1890	62,090	50,195	90,837	203,122
	1900	80,852	68,687	125,241	274,780
	1910	84,290	88,823	129,365	302,478
Value of land and improvements other than buildings.	1880	\$1,658,333	\$762,759	\$1,942,916	\$4,364,008
	1890	1,832,420	\$70,780	2,226,750	4,929,950
	1900	1,421,020	929,690	1,302,840	3,953,550
	1910	2,396,144	2,349,304	2,199,727	6,945,175
Value of buildings.....	1900	419,940	315,610	517,620	1,253,170
	1910	868,480	800,483	788,004	2,456,967
Value of implements and machinery	1880	36,547	17,652	35,727	89,926
	1890	48,800	28,220	43,940	120,960
	1900	67,080	49,400	67,470	203,950
	1910	95,127	89,545	88,101	272,773

¹Includes buildings.

¹See Farmers' Bulletin 222, on Home Mixed Fertilizers.

Item.	Year	Cabell County	Lincoln County	Wayne County	Hunting- ton area
Value of live stock.....	1880	173,036	178,830	335,276	687,142
	1890	273,720	264,290	459,200	997,210
	1900	367,010	401,688	633,028	1,401,726
	1910	609,374	684,997	847,728	2,142,099
Value of products not fed to live stock	1880	253,451	224,685	401,373	870,509
	1890	412,360	352,600	446,110	1,211,070
	1900	649,696	630,020	962,687	2,242,403
Value of orchard products.....	1880	10,962	11,985	17,953	40,900
	1890	.....	.....	.....	.....
	1900	33,422	20,334	30,918	84,674
Value of forest products.....	1880	31,074	21,722	57,540	110,336
	1900	58,572	53,634	141,297	253,503
Expenditures for fertilizers.....	1890	511	418	76	1,005
	1900	4,400	1,240	330	5,970
	1910	6,916	4,724	495	12,135
Expended for labor.....	1900	36,920	14,540	28,790	80,250
	1910	56,699	48,430	49,637	154,766

¹Includes products fed to live stock.

There are many suggestions that can be offered for the improvement of the agricultural conditions, but only the most important ones and those that affect more closely the building up of the soils and the growing of some well-adapted crops can be touched upon in this report.

Fertilizers should be used more generally with tobacco upon the terrace and upland soils. Lime should be applied freely to acid soils or soils where red clover will not thrive. Low-lying, poorly drained land, where it is near enough to market to warrant the production of truck crop, should be drained. The increased production would more than pay for the installation of a drainage system. Upon the hill land more stock should be kept, orchards extended and less land kept in intertilled crops. The more level spots should be picked out for intensive agriculture.

Upon the well-drained terrace soils alfalfa should succeed if the soil is well limed (1 to 2 tons burnt lime or 2 to 4 tons of crushed limestone per acre), the ground inoculated and the seed bed thoroughly prepared. Cowpeas and soy beans should be used more freely, as they not only improve the physical condition of the soil, but add nitrogen. Winter vetch¹ is grown to a very limited extent and is well adapted to this area. It should be used as a winter cover crop and can be planted with either oats or rye or alone. This crop is especially recommended as a cover crop for tobacco land. It protects the land from washing and also materially increases the yields of tobacco. Peanuts² would be found profitable upon the sandy soils. They can be utilized for hogs, and the expense of gathering the crop avoided.

¹See Farmers' Bulletin 360 for information concerning crop.

²See Farmers' Bulletin No. 431.

Irish potatoes¹ are well adapted to the terrace soils of the area and are a paying crop whether put upon the local market or sold elsewhere. Truck crops should be grown in sufficient quantities to supply the Huntington market.

Special attention should be paid to the condition of sod land. Where spots begin to die or weeds come up it should be renovated by resodding or by adding manure, lime, or nitrate or soda or fertilizer high in phosphates to stimulate the growth of grass. In this way the life of the sod may be extended for many years and better protection be given the hillsides.

SOILS.

The soils of the Huntington area fall into two natural groups, according to method of formation. They are either residual, i. e., derived from the underlying rocks, or alluvial, formed from stream deposits. The residual types consist of soils that have weathered from sandstones and red and gray shales. The alluvial soils are divided into two groups, terrace and first-bottom soils. The terrace soils represent the old flood-plain deposits of the streams when they flowed at a higher level, and the first-bottom soils the deposits of the present flood plain of the streams.

The following scheme gives the names of the several soils mapped and the material from which they are formed:

Upland, residual.	{	Fine-grained sandstone.....	{	
		Arenaceous shales.....		Dekalb silt loam.
		Sandstone (fine and coarse) and gray shales.....		Wheeling silt loam.
		Sandstone, red and gray shales, and limestones.....		Meigs clay loam.
		Coarse, hard sandstones.....		Rough stony land.
Terrace, old alluvium.	{	Ohio River (glacial material)....	{	Wheeling silt loam.
				Wheeling silty clay loam.
				Wheeling fine sand.
		Other streams {		
First-bottom over-flow land, alluvium.	{	Derived from Meigs soils....	{	Tyler silt loam.
				Holston silt loam.
		Derived from Dekalb soils....		Holston silty clay loam.
				Holston fine sandy loam.
		Derived from Meigs soils.....		Huntington silt loam.
		Derived from Dekalb soils.....		Huntington loam.
				Huntington fine sandy loam.

For convenience the soils are subdivided into series which include types similar in origin, formation, color and other characteristics, with the exception of texture. The members of a series are known as soils types, this separation being based upon differences in texture.

The upland soils are derived from the stratified formations of the lower Dunkard, Monongahela, Conemaugh, Allegheny and Pottsville series of the Upper Carboniferous era. The geological disturbances and subsequent erosions have had a marked influence upon the distribution of the soil types.

The formations rise gradually in both directions from the Parkersburg syncline, the line of which passes through the area in a general northeast and southwest direction. Entering the area from Mason county, three miles from the intersection of the Mason-Cabell county line, west to the Putnam county line, the line of the syncline passes through Teays valley three miles west of Milton, crosses the Guyandot

¹See Farmers' Bulletin No. 356.

river two miles south of Martha, passes one-half mile south of Bowen, crosses Twelvepole creek three-fourths mile south of Dickinson and passes out of the area near the mouth of Grayston creek on the Big Sandy river.

The axis of the syncline varies but rises gradually to the southwest. Thus in the extreme northern part of the area the lower strata of the Dunkard formation are found capping the hills, and in the western part the Monongahela formation occupies the same relative position. Passing south or southwest from the syncline the formations rise slowly until they reach a line, rising in the same general direction with the syncline through Hamlin, Wayne and Louisa. Proceeding beyond this line the formations rise rapidly for several miles, then follow a fairly even horizon until within a few miles of the southern boundary of the area, where they rise toward the Warfield anticline.

The first of these rises brings the sandstones of the Allegheny formation to the surface. These form the Dekalb stony silt loam and the Rough stony land. From the crest of the first rise to the beginning of the second the formations of the lower Conemaugh, giving rise to the Meigs clay loam, are found capping the hills. These formations disappear before reaching the southern boundary of the area, leaving the sandstones and gray shales of the Allegheny formation on the hill-tops. Here the soil of the hillsides is derived from the upper Pottsville formation. As there is no red shale and very little gray shale below the Conemaugh formation, the Dekalb soils predominate over the part of the area where these formations outcrop. The red shales are not as prominent in the Huntington area as in other regions previously surveyed in this State, and consequently there is no extensive development of the Upshur clay, the Upshur material occurring only intermingled with Dekalb material and being mapped as the Meigs clay loam.

The Dekalb silt loam is developed to a very small extent. Erosion has reduced the hills that are capped by sandstone to narrow "hogback" ridges, in most places leaving no room for a type that is deeply weathered and normally occurs upon broad, flat-topped ridges.

The Rough stony land is more prominently developed in this area than in the Point Pleasant area, owing to the outcropping of a large number of coarse, hard, massive sandstone formations. To this is also due the stony character of the Dekalb stony silt loam.

The first-bottom or overflowed lands form the Huntington series. The type shows a marked relation to the main upland soil types. The Huntington silt loam is derived largely from the Meigs clay loam, while the Huntington fine sandy loam comes almost wholly from the Dekalb stony silt loam. The Huntington loam is found developed along the Ohio river, occupying the same relative position as found in the other areas to the north.

The Wheeling series comprises the brown Ohio river terrace soils having a gravelly substratum. Some of the included material undoubtedly comes from glacial soils farther north from which a part of the Ohio drainage is drawn. Only three members of the Wheeling series are found in this area. The Wheeling silt loam is quite extensively developed and is fairly representative. The fine sand occurs in only one small area. The Wheeling silty clay loam has not been encountered in other areas and is due largely to the intermingling of large quantities of local material from lateral streams with the glacial material.

The Holston and Tyler soils include old alluvium of the terraces

and abandoned valleys of streams rising in the unglaciated Appalachian region. Most of the material comes probably from sandstone and shale formations. The Holston series comprises the well-drained brown soils; the Tyler the poorly drained gray soils. The Holston silty clay loam represents the second-bottom land along the streams that receive their drainage from the Dekalb stony silt loam. The Holston fine sandy loam is found along the streams just below the outcrops of the series of sandstones belonging to the lower Cone-maugh, Allegheny and Upper Pottsville formations. The Tyler silt loam is developed along streams whose drainage basins are composed mainly of the Meigs clay loam.

The Holston silt loam occupies the ancient river beds and terraces. The material that comprises this type was probably originally deposited largely when the streams were dammed with ice¹. In any event, the deposits were deep across the entire valley. Originally the deposits existed as a valley plain, and in places such is the case now, but there has been considerable dissective erosion over the bottoms of the old valleys. The type in this area contains fewer laminated clay beds than the areas in the Teays valley section of the Point Pleasant area.

The extent of alluvial soils in this area is small in comparison to the extent of upland soils.

The following table gives the names and actual and relative extent of the soil types encountered in the Huntington area:

Areas of the different soils.

Soil.	Acres.	P. ct.	Soil.	Acres.	P. ct.
Meigs clay loam.....	421,440	52.5	Wheeling silt loam.....	3,904	0.5
Dekalb stony silt loam....	245,248	30.5	Wheeling silty clay loam...	3,392	.4
Huntington silt loam.....	37,440	4.7	Dekalb silt loam.....	3,392	.4
Huntington fine sandy loam	22,272	2.8	Holston fine sandy loam...	2,624	.3
Holston silt loam.....	22,080	2.7	Huntington loam.....	1,152	.1
Rough stony land.....	21,376	2.7	Wheeling fine sand	256	.1
Holston silty clay loam....	13,248	1.6			
Tyler silt loam.....	5,376	.7	Total.....	803,200	.....

DEKALB SILT LOAM.

The Dekalb silt loam consists of 8 to 10 inches of gray, light, friable silt loam, underlain to 36 inches or more by yellow to yellowish-brown heavy silt loam, becoming heavier and more compact in the lower portions.

The type is weathered to a considerable depth and the parent rock is not usually found at less than 6 feet below the surface. Rock fragments are rarely encountered within 36 inches of the surface.

The Dekalb silt loam is derived from the weathering in place of fine-grained sandstone and arenaceous shales and is confined to the flat-topped ridges in the northern part of Cabell county, where the Waynesburg sandstone comes to the surface. Some areas of this type are also scattered through the Meigs clay loam, usually on the tops of narrow ridges. Such areas were too small to be shown on a map of the scale used in this survey.

¹See Huntington and Charleston Folio, U. S. Geological Survey.

The topography is usually level to gently rolling and drainage is well established, owing both to the elevation and slope of the areas and to the porous condition of the substratum of sandstone fragments.

Practically all the areas of this soil are cleared and under cultivation. The principal crops produced are corn, tobacco, potatoes, wheat and hay.

Corn does only fairly well, yielding from 15 to 45 bushels per acre, according to season, fertilization and condition of soil. In dry seasons crops do not give good returns. The type grows a fine grade of Bright Burley tobacco, with a thin, tough leaf that can be used to advantage for plug wrapper. It is the general practice to use fertilizers or stable manure for tobacco, usually 400 to 600 pounds of an 8-2-5 mixture. Under such conditions about 1,000 to 1,200 pounds of tobacco is secured. Where stable manure only is used the yield is somewhat less.

Wheat usually yields from 15 to 18 bushels. Fertilizers are always used upon this type with wheat, applications ranging from about 250 to 300 pounds per acre. Ammoniated phosphate or bone meal are the most commonly used. Cowpeas, soy beans and clover are used to some extent in rotations and are found to be beneficial to the soil. Vetch should be grown more extensively as a cover crop.

Alsike clover will be found to do well upon the more level areas. The type is not adapted to grass, but produces fair yields of timothy hay and good bluegrass pasture with the use of about 1,000 pounds of lime per acre. Heavy applications of bone meal or floats to wheat crops to be followed by grass are very beneficial to the latter.

All vegetables do well, but are grown largely for home consumption. Cabbage, beans and Irish potatoes give relatively the best yields. The type is especially adapted to Irish potatoes, which yield from 200 to 250 bushels per acre. More attention should be paid to this crop and larger areas planted.

The type is probably the best fruit soil in the area. It is well located with reference to air drainage and the even surface permits the use of spraying apparatus. Trees make a healthy growth, are long lived, and both color and quality of the fruit are excellent. Apples constitute the larger proportion of the fruit grown and probably are the most profitable. The Ben Davis and Rome Beauty are the leading varieties. Elberta peaches appear to be the variety best adapted to the type. Plums and cherries do well, but are found only in small numbers in mixed orchards. Strawberries and raspberries should be given more attention. Commercial orchards are not very extensively developed upon this type in this area, but are found upon it in adjoining counties in Ohio.

The type as a rule is deficient in organic matter, and when stock is not kept in sufficient numbers to furnish manure, green crops should be turned under. Plowing should be deep to incorporate with the soil all the organic matter left on the surface, such as stubble and weeds. The soil is easily cultivated and when plowed under the proper moisture condition forms a mellow seed bed.

Land of this type of soil is valued at \$20 to \$30 an acre, the price depending largely on the character of improvements.

The following table shows the results of mechanical analyses of samples of soil and subsoil:

Mechanical analyses of Dekalb silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay 0.005 to 0 mm
220917	5 miles north of Milton.	Gray silt loam, 0 to 10 inches.	P. ct. 0.4	P. ct. 2.0	P. ct. 1.3	P. ct. 3.1	P. ct. 5.2	P. ct. 76.8	P. ct. 11.0
220918	Subsoil of 220917.	Heavy silt loam, 10 to 36 inches.	.0	1.3	.9	2.1	3.5	68.0	23.9

DEKALB STONY SILT LOAM.

The Dekalb stony silt loam consists of a gray or grayish-brown, friable silt loam to silty clay loam, underlain at variable depths, usually between 4 to 18 inches, by a friable, yellow or yellowish-brown silty clay loam, usually slightly compact and heavier in the lower part of the profile. Typically both soil and subsoil contain considerable quantities of sandstone fragments, occasionally of sufficient size and quantity to make cultivation difficult and in some places impossible. Some areas are stony enough to constitute Rough stony land, but these were inextensive and therefore of too little importance to justify separation in mapping.

The topography of the type is prevailingly very steep and drainage is excessive (see Pl. II, fig. 1). There are gentler sloping areas, however, that are cultivated, but even the most of these are so steep that plowing is done with considerable difficulty. In mapping this type the question was raised as to whether it could not be classified with such land as has been called in other areas Steep broken land. A thorough study of the type as a whole showed that it included too many areas that could be cultivated. The lower slopes of many of the small stream valleys, "coves," are cultivated. Not infrequently abandoned fields are seen in which the soil has practically all been washed away, leaving very stony areas and in places practically rock outcrop. Good fields of tobacco were seen even above the 1,200-foot contour line (see Pl. II, fig. 1). In harvesting tobacco it is a common practice in some sections, as in the Big Creek neighborhood near the Logan county line, to transfer the stalks with leaves attached to the curing barn in the valley below by a wheel operating on a wire stretched between the field and barn.

In many places, especially along the horizon of the outcrops of the Charleston sandstone, there is an appreciable increase in the quantity of sand in the soil, though the content is not high enough to warrant its classification as a sandy loam. These sandy areas usually contain a large quantity of fragmental rock.

By far the greater part of the type is covered with forest, some virgin, but for the most part cut-over and second-growth land. The timber consists mainly of oak, chestnut, walnut, hickory and locust. Very little of the type is cleared and used for agriculture. As a rule it is too steep to cultivate and is not well adapted to grass, although many patches are found where tobacco and corn are grown. New



FIG. 1.—Characteristic Topography of the Dekalb Stony Silt Loam, and Tobacco and Corn on the Smoother, Less Stony Slopes near Rector, on Big Ugly Creek.
(The tobacco field in the foreground is at an approximate elevation of 1,200 feet above sea level or about 400 feet above the stream bottom in the background).



FIG. 2.—A section of Tyler Silt Loam as Shown in Stream Bank at Barboursville, W. Va.

land is usually used for tobacco. A good grade of Bright Burley tobacco is produced, the yields running usually about 1,000 pounds per acre. Fertilizers should be used for this crop. Corn yields from 10 to 25 bushels per acre. The type is too steep for harvesting such crops as wheat, oats and barley. Cowpeas could be used to advantage with corn. They add nitrogen and organic matter to the soil, and thus increase the subsequent yields of crops. They furnish a nutritious feed for stock, the roots help to hold the soil in place and prevent erosion. Both apples and peaches do well upon the hill-tops and more level benches and may to a great extent prove the solution of the agricultural development of the cultivable portion of the type. Most of the type is entirely too steep for successful orcharding, but there are many places upon which orchards would pay.

The number of live stock that can be kept upon the type is small, as the land is not adapted to grass. Liming would improve the pasturage and hay yields in a considerable degree.

A very large part of the type should be left in forest, as its surface features do not adapt it to agriculture. Some land of this type is valued at \$15 an acre. There are large cut-over tracts that can be bought exclusive of mineral rights for less than this.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Dekalb stony silt loam:

Mechanical analyses of Dekalb stony silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
220921	2 miles north of Big Creek.	Silty clay loam, 0 to 6 inches.	0.6	3.5	9.6	23.1	7.8	42.0	13.4
220922	Subsoil of 220921.	Silty clay loam, 6 to 36 inches.	.3	2.6	4.0	17.8	15.9	38.5	20.8
220925	5 miles southeast of Fort Gay.	Gray silt loam, 0 to 8 inches	1.4	4.4	3.0	13.9	15.1	50.0	12.2
220926	Subsoil of 220925.	Silty clay loam, 8 to 36 inches.	.8	3.9	2.7	10.9	11.1	52.9	17.3

MEIGS CLAY LOAM.

The Meigs clay loam consists of undifferentiated Dekalb and Upshur material. The formations giving rise to the type are alternating thin strata of sandstone and red shale, with an occasional thin bed of gray arenaceous shale and limestone. The sandstones weather into Dekalb silt loam with a gray soil and yellow subsoil¹.

The red shales, which are more or less calcareous, weather into Upshur clay, which consists of dark red to dark reddish brown, slightly friable clay loam soil from 3 to 6 inches deep, underlain by a red plastic clay.

The gray shales weather into a heavier phase of the Dekalb soil, but are not extensive enough to influence appreciably the type. Where the coarse-grained sandstone and shales outcrop—usually upon the narrow ridges—the sand content is noticeably higher and

¹This soil is fully described on page 438.

the material approaches the Dekalb sandy loam in texture. Such areas are too small to be shown upon a map of the scale used in this survey. The limestone strata are thin and scattered, but influence the surrounding soils to some extent, particularly upon Watts Ridge, in Wayne county, and upon the hillsides in the eastern part of Lincoln county.

Upon the steep slopes the weathered materials from the formations that give rise to the type become very much mixed through landslides and colluvial action and an intermediate (Dekalb-Upshur) soil is the result. The greater proportion of the intermediate soil is usually a gray or reddish-gray silt loam to silty clay loam varying in depth from 2 to 8 inches and underlain by a yellow or reddish-yellow silty clay loam, grading at about 20 inches into a dull red or mixed red and yellow clay. Much of the type has a gray silty soil (Dekalb material) and an Upshur clay subsoil.

In this area the proportion of the Upshur material and of the intermediate type included in the Meigs clay loam are about equal to the Dekalb material, owing to the fact that the red shale formations are thinning and the sandstone thickening to the south. The proportions vary at different points, owing to the unequal mixture of the material comprising the type.

Nearly all of the type carries large quantities of small, partially weathered sandstone and shale fragments scattered over the surface and throughout the soil mass. These fragments are rarely present in quantities sufficient to interfere with the cultivation of the type, being found more abundantly in the deeper subsoil. In many places the parent rock material lies at depths of 24 to 30 inches, but over the greater proportion of the type it does not occur within 36 inches of the surface.

The topography of the type is steep over the greater portion of its extent, and the ridges are usually narrow. In some places where they broaden out and the hilltops are more rounded, a more gentle topography occurs. The alternating hard and soft strata of the formations give rise to frequent benches on the hillsides, which show up very plainly in the cleared areas. Owing to the steep topography the drainage is excessive and crops often suffer during dry seasons for lack of moisture.

The Meigs clay loam is the most extensively developed soil in the area, comprising nearly all of the upland sections north of a general east and west line passing south of Griffithsville, Wayne and Fort Gay. To the south of this line the type is found upon the ridge tops and it entirely disappears before the southern limit of the area is reached.

On account of the large percentage of Upshur material contained in the Meigs clay loam, it is difficult to handle and requires a very heavy draft for plowing to the proper depth. If plowed too wet clodding results and when dry it has a tendency to bake and become very hard, making plowing very difficult. This tendency is more pronounced over the red clay portions of the type.

Plowing should be done upon this type late in the winter to gain the advantage of the alternate freezing and thawing of early spring in reducing the clods to a mellow seed bed. If the preliminary preparations of the land be delayed until early spring the type can not be brought into proper condition for seeding until late in the season.

The principal crops grown upon the type are corn, wheat, tobacco and hay. Corn gives fair yields, ranging from 15 to 45 bushels per

acre, wheat from 10 to 20 bushels, the best results being obtained upon the ridges. Applications of 250 to 300 pounds of bone meal or ammoniated phosphate per acre are used for the latter crop. Tobacco does well and is the most extensively planted crop upon this type. Except where new land is used from 400 to 500 pounds of an 8-2-5 fertilizer is required to produce from 1,000 to 1,500 pounds of average quality Bright Burley tobacco. Timothy hay yields about 1½ tons per acre, but most of the type is too steep for the use of mowing machines. The type is fairly well adapted to clover, especially in the areas influenced by limestone. Burnt lime should be applied at the rate of about 1,000 pounds per acre before seeding to grass or clover. Bluegrass comes in naturally, but where sowed with a nurse crop it gives a better stand. Where seeding is carefully done a sod is secured that will last for 10 to 15 years under ordinary circumstances and if judiciously grazed and properly cared for the life of the pastures can be prolonged indefinitely. By far the greater proportion of the cleared area of the type is in bluegrass pasture at present.

A large number of beef cattle and a few sheep are grazed on the Meigs clay loam. Stock raising is recommended as the best means of utilizing the hillside which are too steep for cultivation.

It is recommended that the hilltops be kept under cultivation, using rotations of corn, tobacco, wheat and grass (timothy and clover). Cowpeas, soy beans and vetch should be more generally used. Vegetables do fairly well and where the type is located near markets trucking could be made profitable. At the present time vegetables are grown only for home consumption.

Where the topography permits the type is well adapted to the growing of fruit on a commercial scale. Very little attention has been paid to fruit and only a few large orchards are found. These are mainly apple and peach orchards. The varieties of apples seemingly best adapted to soil and climatic conditions are the Ben Davis and Rome Beauty. The Elberta and Crawford peaches seem to do best and are the most extensively grown. Very little attention has been given to plums, cherries or small fruits, although they are apparently well adapted to the local conditions.

A large proportion of the type is cleared and either in pasture or cultivated crops. The natural forest consists largely of oak, chestnut, chestnut oak, hickory and walnut. The second growth is largely oak and locust.

Land composed of this type of soil may be bought for prices ranging from \$10 to \$20 an acre.

ROUGH STONY LAND.

The Rough stony land comprises areas so covered with stone or containing so many rock outcrops as to make farming impracticable.

Areas of this character occur for the most part along the valley walls of the larger streams. They are very steep and broken and in many places form rocky cliffs.

Rough stony land is most extensively developed in the southern part of the area, where the thick, hard sandstone strata of the Allegheny and Pottsville formations lie above drainage levels.

By far the greater proportion of the type is in forest and should remain so, as crops can not be successfully cultivated, and the small areas that might be used as pasture hardly warrant the clearing of the land.

WHEELING SILT LOAM.

The soil of the Wheeling silt loam consists of a light-brown, friable silt loam, 10 to 12 inches deep. The subsoil is a yellow or yellowish-brown, slightly compact, heavy, though friable, silt loam to silty clay loam, becoming lighter in color and more compact with depth. Beds of gravel and sand are usually encountered at 10 to 20 feet below the surface and a few waterworn quartz fragments are found scattered over the surface and throughout the soil profile. Slight elevations or swells are found throughout the type where the sand content is relatively high, but not sufficiently so to place the type in a lighter class. The material forming the type was deposited by the river upon an old flood plain, when the stream flowed at a higher level than at present. Undoubtedly the type carries considerable glacial material brought down from the glacial soils in the northern portion of the Ohio river drainage basin. Also it contains material from the residual soils of the drainage basin to the south of the glacial lakes. The underlying beds of gravel appear to be largely glacial in origin.

Areas of the Wheeling silt loam occur along the Ohio river, where they occupy the third and fourth terraces, with an average elevation of 50 to 70 feet above the first bottoms of the stream. This soil has not suffered markedly from erosion and the terraces are fairly intact, although a great proportion of the original terrace has doubtless been removed by stream action. The topography is level to gently undulating, though owing to the underlying strata of gravel the drainage is excellent.

This type of soil is not very extensively developed in the Huntington area, being found at intervals along the Ohio river. The largest developments are near Huntington, Kenova, Greenbottom and Cox Landing. The larger proportion of the type is within the limits of Huntington and Kenova, and as it lies above high water much of it is occupied by buildings. This leaves but a small area to be considered agriculturally.

Owing to its light texture and friable structure, this soil is easy to cultivate, and when plowed under the proper moisture conditions forms a mellow seed bed. Any clods that may result are easily broken down and very little trouble is encountered in handling the type. It is the strongest of the Wheeling soils and one of the best types in the area. It has been under cultivation since the opening of the country and in places much of the organic matter has been depleted by continued clean-culture cropping. In other places this type is probably the best cared for of the soils found in the area and the results obtained under such conditions show its possibilities where properly farmed.

The Wheeling silt loam is well adapted to the general farm crops produced in this section. Corn yields 40 to 80 bushels per acre, wheat 15 to 20, oats 25 to 30, rye from 30 to 35 tons, and hay $1\frac{1}{2}$ to 2 tons. Tobacco is grown to a limited extent and yields satisfactorily both as regards quality and quantity. The type is the best Irish potato soil in the area, from 200 to 300 bushels per acre being secured. Vegetables do well and trucking could be profitably extended. Good orchards of apple and peaches are found, but the hill lands are generally preferred for commercial orcharding.

Fertilizers are seldom used upon this type, except for wheat, tobacco and heavy truck crops. Intensive farming should be practiced and truck growing for the local markets made the chief interest. At least 10 or 15 wagon loads per acre of stable manure should be

used where practicable, and where this can not be secured leguminous crops should be grown and turned under to supply organic matter. Where clover does not thrive about 1,000 pounds of burnt lime per acre should be applied and well harrowed in some time before seeding. Alsike clover thrives and should be used more extensively, as should cowpeas, soy beans and vetch. In preparing for wheat to be followed by grass applications of bone meal ranging from 500 to 600 pounds per acre should be made.

The type is all cleared and occupied either by buildings or cultivated crops. The price of the agricultural land varies from \$100 to \$250 per acre, according to location and improvements.

The results of mechanical analyses of samples of the soil and subsoil of this type are shown in the following table:

Mechanical analyses of Wheeling silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Cay. 0.005 to 0 mm.
220901	Huntington	Silt loam, 0 to 10 inches.	P. ct. 0.0	P. ct. 1.1	P. ct. 1.5	P. ct. 10.5	P. ct. 9.0	P. ct. 63.0	P. ct. 14.8
220902	Subsoil of 220901:	Heavy silt loam, 10 to 36 inches.	.0	.9	1.3	10.4	12.5	54.2	20.4

WHEELING FINE SAND.

The soil of the Wheeling fine sand consists of a gray or brownish-gray to grayish-brown, loose and incoherent fine sand, from 8 to 10 inches deep. The subsoil is a yellowish-brown, slightly compact fine sand to a depth of 36 inches or more and frequently extending to depths of 20 or 30 feet.

This type of soil is developed only in one place in the Huntington area. It occurs upon domelike areas banked against the base of the hills at Greenbottom. It is largely formed by wind-blown material derived from the other Wheeling terraces during dry seasons, and represents old alluvium. Drainage is excessive, owing to the rolling topography and open structure of the soil and subsoil.

The type is not naturally strong, but with the use of manure fair yields of nearly all the crops grown in this section can be obtained. The soil is best adapted to light truck crops, including melons. Grasses, clover, oats, tomatoes, cabbage, tobacco, millet, wheat and heavy truck crops do not thrive. Rye does fairly well, yielding from 20 to 30 bushels per acre. Corn gives 30 to 40 bushels where manure is used. When this is not practicable the necessary organic matter may be supplied by plowing under cowpeas, soy beans or vetch. The soil is also well suited for the production of peanuts and sweet potatoes. The type can not be recommended for orcharding, as the trees bloom too early and are likely to be caught by frost.

The Wheeling fine sand is easily cultivated and can be plowed in almost any moisture condition without impairing its physical condition. Crops mature earlier than upon any other type in the area, and for this reason alone it should all be used in the production of early truck. Late crops are apt to suffer for lack of moisture.

All of the Wheeling fine sand is cleared and under cultivation, values ranging from \$75 an acre upward.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of this type.

Mechanical analyses of Wheeling fine sand.

No.	Locality.	Description.	Fine gravel, 2 to 4 mm.	Coarse sand, 4 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220905	Greenbottom	Yellowish - brown fine sand, 0 to 8 inches.	P. ct. 0.2	P. ct. 2.9	P. ct. 8.6	P. ct. 64.6	P. ct. 8.0	P. ct. 11.2	P. ct. 4.2
220906	Subsoil of 220905.	Fine sand, 8 to 36 inches.	.0	2.4	8.6	58.6	8.1	17.2	5.2

WHEELING SILTY CLAY LOAM.

The Wheeling silty clay loam consists of about 10 inches of dark-brown, friable silty clay loam, underlain by yellow or yellowish-brown, compact though friable silty clay loam, slightly molted with drab. In poorly drained areas the subsoil is much more plastic than in better drained areas.

Second terraces along the Ohio river, slightly lower than those occupied by the Wheeling silt loam, show the Wheeling silty clay loam. The material is identical with that giving the Wheeling silt loam, except that it is slightly heavier in texture and poorly drained. The areas are inundated during very high floods, but this does not appreciably affect the character of the soil, as the periods of inundation are widely separated and their duration is very short.

The type is found in comparatively narrow strips along the Ohio river, and, like the silt loam type, the largest areas occur within the corporation limits of Huntington and Kenova.

The Wheeling silty clay loam is easily cultivated and adapted to practically the same crops as the silt loam. It is not as early as the latter type and probably a little better suited to grass, corn, oats, and varieties of vegetables requiring a moist soil. It is not quite so well suited to potatoes as the better drained silt loam. Alsike clover does well and may be used where red clover will not give a satisfactory stand.

The type is better supplied with organic matter than the silt loam, but needs lime, applications of about 1 ton per acre being required to correct acidity.

Growing truck crops for local markets is the most profitable way to utilize areas of this type.

Prices for land of this type range from \$100 to \$150 an acre.

Mechanical analyses of samples of the soil and subsoil of the Wheeling silty clay loam gave the following results:

Mechanical analyses of Wheeling silty clay loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, .25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220915	½ mile west of Central City.	Heavy silty loam, 0 to 10 inches.	P. ct. 0.0	P. ct. 0.4	P. ct. 0.7	P. ct. 4.5	P. ct. 8.4	P. ct. 65.9	P. ct. 20.5
220916	Subsoil of 220915.	Silty clay, 10 to 36 inches.	.0	.1	.4	2.2	9.8	59.7	27.8

HOLSTON SILT LOAM.

To a depth of 8 to 12 inches the Holston silt loam consists of a dark-brown to grayish-brown, medium heavy, friable silt loam. Beneath this is a yellowish-brown or yellow, heavy but friable silt loam, becoming heavier and more compact with depth.

Areas of this soil occupy old river channels and terraces. They have suffered greatly from erosion. The depth to the original bed rock upon which the component material of the type was deposited is somewhat variable, the result, at least in many instances, of erosion. There are some places where residual material from the underlying sandstone or shale comes within the 3-foot section. In places beds of water-rounded gravel and small bowlders, varying in size from one-fourth inch to two feet in diameter, are developed in the lower part of the subsoil. These are mostly of quartz and flint. Occasional beds of sand are encountered, but they are usually not extensive enough to have much effect upon the soil.

To the east of Milton, in Teays valley, beds of laminated clays occur at varying depths. Where exposed by erosion this clay gives rise to areas known as "gall spots." They are caused by the impervious nature of the clay. The water flowing through clay beds along the bedding places seeps out in places to give rise to poorly drained spots of little agricultural value.

The largest bodies of the Holston silt loam occur in Teays valley, the ancient bed of the Kanawha river.¹ Smaller areas occur also in the old bed of the Big Sandy river. The material was probably derived originally from sandstones and shales.

The surface is level to gently rolling, with an average elevation of about 700 feet above sea level. The greater part of the type lies about 150 feet above the first bottoms of the larger streams. Drainage is usually good, but in places where the clay strata are near the surface it is only fairly well established.

This is naturally a fairly strong soil, but through heavy cropping and poor management, extending over a period of many years, many fields have had their productiveness markedly lowered. In the few cases where the type has been properly managed it is still very productive. Only within the last few years has any attention been paid to building up the type in general.

Diversified farming is the usual practice upon this type. Tobacco, wheat, oats, corn, potatoes and hay (timothy, clover and cowpea) are the principal crops. Tobacco is probably the best paying crop.

¹See U. S. Geological Survey, Huntington and Charleston Folios.

The quality of leaf is good and the yields, where fertilizers are used, are heavy. With the use of about 400 or 600 pounds of 8-2-5 fertilizer a yield of 1,200 to 1,500 pounds of tobacco per acre may be expected. The leaf commands a better price than any other grown in the area and is used largely for plug wrapper.

Wheat with the use of about 250 pounds of bone meal, yields from 18 to 20 bushels per acre. Oats, rye, and barley are grown only in a limited way. Grasses do fairly well, but very little of the type is in mowing or pasture. Timothy hay yields about 1½ to 2 tons per acre. Corn is planted to some extent, yielding 20 to 60 bushels per acre, according to the condition of the land. Soy beans and cowpeas are grown for forage and have been found very beneficial to the land. Clovers do fairly well and they are used in rotation more than any other of the leguminous crops. Where difficulty is experienced in growing red clover heavy applications of lime should be made or alsike clover substituted. Vetch should be used as a cover crop, as it is well suited to both soil and climatic conditions. It is not used at present, so far as could be ascertained.

Irish potatoes are well adapted to the Holston silt loam and yield from 150 to 250 bushels per acre. This crop should be grown more extensively. Both early and late potatoes seem to do well. Other vegetables and truck crops succeed. Trucking might become one of the leading industries upon the type, but at present it is given very little attention. Cabbage, beans, peas and tomatoes yield particularly well. Strawberries, blackberries and raspberries thrive. They are grown largely for home consumption. Plums, cherries and pears are found in nearly all home orchards. Vineyards appear to be productive. Some commercial apple and peach orchards are found, but the type can not be recommended for fruit growing on a large scale, as the fruit does not color highly and the crop is too often damaged by frost.

Fertilizer should be used upon the type for most crops and as much organic matter incorporated in the soil as possible. The type is easy to cultivate, breaking down into a mellow seed bed when plowed in the proper moisture condition. Plowing should be deep and all added organic matter thoroughly mixed with the soil.

The original forest growth consisted largely of white oak, poplar, elm, sycamore and beech. Most of the type is cleared and under cultivation. Land values range from \$25 to \$50 an acre.

The following table shows the results of mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Holston silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
220911	Near Gaylorsville.	Silt loam, 0 to 10 inches.	0.2	0.5	0.5	0.9	9.9	76.8	11.2
220912	Subsoil of 220911.	Heavy silt loam, 10 to 36 inches.	.0	.0	.2	.5	8.0	72.0	19.3
220923	2 miles east of Milton.	Silt loam, 0 to 10 inches.	.8	4.4	8.2	11.8	4.8	58.9	10.9
220934	Subsoil of 220933.	Heavy silt loam, 10 to 36 inches.	.6	3.7	5.6	8.9	2.1	62.6	15.9

HOLSTON SILTY CLAY LOAM.

The Holston silty clay loam consists of a dark-brown, mellow silty clay loam, 10 to 12 inches deep, underlain by a yellowish-brown, fairly compact, friable silty clay loam, grading below into compact silty clay. Slight mottlings of drab and reddish or brownish iron stains and a tendency to plasticity are noted in the deeper subsoil of poorly drained areas. The latter approach the Tyler soils in general characteristics.

Areas of this type form second-bottom lands along the larger streams. The material is largely washed from upland areas of Dekalb and is found only upon the streams that head in regions occupied chiefly by Dekalb soils.

The topography is level to gently rolling and drainage is fairly well established. The type is found well developed along the Big Sandy river, Guyandot river and Twelvepole creek. The type usually lies from 40 to 60 feet above stream level.

The soil is not hard to handle if care is exercised not to disturb the surface while too wet. If plowed in this condition clodding results, and it is very difficult to bring the land into proper condition for crops. When dry plowing is difficult, but when undertaken at the right stage of moisture conditions a mellow seed bed results.

The crops grown upon the type are corn, wheat, oats, tobacco, hay (timothy), cowpeas, millet and soy beans. Corn is grown more extensively than any other crop, with the exception, perhaps, of timothy, and yields from 30 to 50 bushels per acre. Wheat and oats are grown to a very limited extent, yielding from 10 to 20 bushels and 20 to 30 bushels per acre, respectively. These yields are usually made with the use of small quantities of bone meal.

In some sections tobacco is grown extensively, the leaf being of good quality and the yields heavy, particularly when manure or fertilizer is used. Vegetables, especially tomatoes, potatoes, beans and cabbage, do well. Fruits do not thrive, owing to the low position occupied by the type.

The soil is better adapted to grass than to any other crop, and a large proportion of the type is in mowing land and pasture. Timothy yields from 2 to 2½ tons per acre. Crab grass comes in naturally and makes sufficient growth to warrant cutting it for hay. It usually forms a part of the growth on land sowed to cowpeas or soy beans. The soil is better adapted to alsike clover than to red clover. The legumes, and especially cowpeas, soy beans and vetch, should be extensively used to build up the type.

In places the soil is acid, especially where the subsoil is mottled. These areas should be treated with applications of one ton of burnt lime per acre or twice this quantity of ground limestone. Where the mottling is not so pronounced lesser quantities will suffice. The lime should be harrowed in thoroughly some time before planting the crop. Liming, in addition to correcting acidity, will improve the physical condition of the soil and in this way also make it more productive.

The production of heavy truck crops may well be extended on the Holston silty clay loam, as the areas are located near excellent markets for these products. Several dairies are maintained upon the type and seem to be on a profitable basis.

Like other terrace soils of the area that are above overflow, the type is deficient in organic matter, and some systematic plan for building up the humus content should be adopted.

The natural forest growth, consisting largely of beech, elm and sycamore, has been removed, and most of the type is either in pasture or cultivated crops.

Farms composed of this type of soil may be purchased for \$50 to \$100 an acre.

The following table gives results of mechanical analyses of samples of soil and subsoil of the Holston silty clay loam:

Mechanical analyses of Holston silty clay loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220931	Buffalo	Brown silty clay loam, 0 to 10 inches.	P. ct. 0.0	P. ct. 0.3	P. ct. 6.9	P. ct. 4.6	P. ct. 6.1	P. ct. 62.0	P. ct. 26.3
220932	Subsoil of 220931.	Silty clay loam, 10 to 36 inches.	.0	.1	.4	2.5	6.3	59.4	21.1
220935	1 mile northwest of Barboursville.	Silty clay loam, 0 to 10 inches.	.0	.3	.9	4.0	5.0	65.7	24.0
220936	Subsoil of 220935.	Silty clay loam, 10 to 36 inches.	.0	.0	.4	1.5	4.3	61.5	32.2

HOLSTON FINE SANDY LOAM.

The Holston fine sandy loam to a depth of about 12 inches consists of a brown light fine sandy loam, loose and open in structure. Below is found a light-brown to yellowish-brown, medium heavy to heavy, slightly compact fine sandy loam, becoming heavier and more compact with depth.

The type occurs as second bottom along the larger streams. It lies above the overflow and from 30 to 40 feet above the streams. In some places the areas form indistinct terraces; in others the surface is marked by ridges and swales running parallel to the streams. The ridges are usually sandy, while the swales are heavy. In general the topography is level to gently undulating.

The open structure of the soil and the comparatively open structure of the subsoil give free internal drainage and make the type somewhat droughty during dry seasons.

The Holston fine sandy loam is not extensively developed in the Huntington area, occurring only on Mud River and Twelvepole Creek below outcrops of the sandstones of the lower Conemaugh, Allegheny, and Upper Pottsville series. It has been formed mainly by deposits of material washed from these sandstone areas.

The light texture and open structure of the soil make it easy to cultivate. There is little tendency to clodding when plowed even in a wet condition, and the soil does not bake. The type is not naturally strong, but is well adapted to the growing of certain crops, such as sweet potatoes, peanuts, melons, cucumbers, and light garden truck. Corn and oats do fairly well, the former yielding from 20 to 50 bushels per acre, the higher yields being secured on fields in good condition and with the use of manure. The ordinary yield of oats is 20 to 25 bushels per acre. The type is not particularly adapted to wheat and tobacco, and where grown large quantities of fertilizers must be used.

Cowpeas and velvet beans do well and are grown to some extent. Hairy vetch is well adapted to this type and should be used more generally as a cover crop. Oats and vetch make an excellent combination for sowing in the fall. Cantaloupes and watermelons are probably the best paying crops at present. The rotation of cowpeas and melons give excellent results, the cowpeas leaving the soil in perfect condition for melon culture.

The natural forest, consisting of elm, sycamore, and beech, has been cleared away and practically all of the type is under cultivation.

The price of farms composed of this type of soil ranges from \$50 to \$75 an acre.

The following table shows the results obtained from mechanical analyses of samples of soil and subsoil of the Holston fine sandy loam:

Mechanical analyses of Holston fine sandy loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
220907	One mile north of Wayne C. H.	Brown fine sandy loam, 0 to 12 inches.	0.0	2.8	17.0	40.7	9.9	20.5	8.9
220908	Subsoil of 220907.	Heavy fine sandy loam, 12 to 36 inches.	.0	.7	7.7	29.7	8.9	34.9	17.7

TYLER SILT LOAM.

The soil of the Tyler silt loam consists of 6 to 10 inches of a dark gray or drab, compact but friable heavy silt loam to silty clay loam, mottled with whitish and dark-brown colors. The subsoil is a light-gray to drab, compact, plastic silty clay loam to silty clay, mottled with yellow, drab and whitish colors, and in the deeper profile with reddish brown. In better drained areas the mottling in the soil and subsoil is not quite so pronounced. Plate II, figure 2, shows a section of this type in a stream bank at Baboursville.

The topography is level to gently undulating. The close structure of the subsoil prevents the downward movement of water and makes the drainage conditions upon the type very poor.

The Tyler silt loam is not extensively developed in the Huntington area. The largest tracts occur along the lower courses of Mud river. Smaller areas are found along the lower streams in the northern part of the survey. The type occurs as second bottom lying above overflow. It represents the old flood plain of the stream when its bed was at a higher level than at the present time. The type is derived from Upshur and Dekalb material and is found largely along streams whose drainage basins lie within areas of Meigs soils.

Owing to the heavy nature of the soil and to its poor drainage, the type is very difficult to handle, requiring heavy draft animals and clodding badly when plowed too wet. The type remains wet a long time after rains. When it does dry out very hard compact condition results. The type is known locally as "crawfish land."

This soil is best suited to grass. It supports many excellent

pastures of bluegrass. Timothy yields from 1½ to 2 tons per acre. Corn does only fairly well, yielding 15 to 30 bushels per acre. Oats and wheat make fair yields when fertilized. Acid phosphate usually gives the best results upon this type, but is used very little. Vegetables do well where large quantities of organic matter are added to the soil, but otherwise garden crops suffer from the baking of the soil. Leguminous crops, as a rule, do not thrive unless the type is supplied with underdrainage.

The Tyler silt loam is usually acid and in need of drainage and liberal applications of lime. At least a ton of burnt lime or twice as much ground limestone should be used. The use of lime will sweeten the soil and markedly improve its physical condition. A leguminous crop or other vegetation should be turned under occasionally and thoroughly incorporated with the soil. This will assist in securing needed aeration.

Practically all the original forest, consisting of white oak and beech, has been removed and the land is in cultivated crops or pastures. The land is valued at \$50 to \$75 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Tyler silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220919	Barboursville	Silty clay loam, 0 to 6 inches.	P. ct. 0.3	P. ct. 3.5	P. ct. 4.4	P. ct. 9.5	P. ct. 11.5	P. ct. 49.3	P. ct. 21.3
220920	Subsoil of 220919.	Silty clay, 6 to 36 inches.	.3	1.4	1.7	5.4	7.4	49.4	34.4

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam consists of 12 inches of dark chocolate brown, medium heavy, mellow silt loam, fairly high in organic matter. The subsoil is a heavy, compact and friable silt loam to silty clay, the same color or only a little lighter than the surface soil, becoming heavier and more compact with depth.

Areas of this type occupy first-bottom or overflow land along the Ohio river and smaller streams draining the northern half of the area surveyed. The material comprising the type is derived largely from the Meigs soils. In a few places where heavy red beds are found above drainage levels the soil has a slightly reddish cast. Such areas are very small. In some places, usually in the smaller valleys, beds of sandstone and shale fragments are found about 2 feet below the surface.

The type reaches its largest development in the Teays valley portion of Mud river and along Beech Fork of Twelvepole creek. Smaller areas are found along the Ohio river and smaller streams. The type is easily cultivated, and when plowed in the proper moisture condition breaks down very readily into a mellow seed bed. When

plowed too wet clodding results, but this is not as serious as upon the heavy upland soils, and the clods left by the harrow are dissolved by the overflows of the following season.

The topography is level to slightly undulating, and drainage over most of the type is good. A few swales and low places are found where drainage is poorly established.

Annual inundations serve to maintain the productiveness of this soil, and it is probably the strongest type in the area. It produces good crops of corn, hay, potatoes, tomatoes and vegetables. More than half of the type is planted to corn each year. The ordinary yields range from 50 to 60 bushels per acre, but in many places 70 to 80 bushels per acre are secured and individual cases of much higher yields are reported. The type makes good mowing lands, timothy cutting $1\frac{1}{2}$ to 2 tons per acre. Tomatoes do especially well and are grown to some extent. Potatoes yield 150 to 250 bushels per acre, and nearly every farmer on this type uses a part of his land for this crop. Cereal crops have a tendency to lodge, and for this reason are not grown. Tobacco is planted extensively, and large yields of a heavy, dark, rather inferior leaf are secured, the larger yields about offsetting the difference in price between the product of this soil and the upland types. During good seasons yields ranging from 1,200 to 2,000 pounds per acre are obtained, usually without fertilizers. Some farmers use small quantities of fertilizer even upon this soil, and these say that the tobacco makes a more balanced growth than where dependence is placed on natural fertility alone. Broom corn is another crop that does well, yielding about 600 to 800 pounds per acre.

It is believed to be advantageous to leave some vegetal covering upon this type to serve as a collector of sedimentary material during the spring freshets.

The natural forest growth, which consisted largely of sycamore, elm and beech, has been removed and the type is practically all under cultivated crops or in mowings. Most of the land is held at \$100 an acre.

The following table shows the results of mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Huntington silt loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220903	One mile south of Cox Landing.	Brown silt loam, 0 to 12 inches.	P. ct. 0.0	P. ct. 0.2	P. ct. 1.1	P. ct. 11.5	P. ct. 22.1	P. ct. 49.2	P. ct. 16.4
220904	Subsoil of 220903.	Heavy silt loam, 12 to 36 inches.	.0	.0	.5	5.4	14.9	56.0	23.2

HUNTINGTON LOAM.

The soil of the Huntington loam consists of 8 to 12 inches of brown to dark chocolate brown, medium to heavy loam. The subsoil is a fine, friable, compact brown loam, somewhat lighter in color than the surface soil and becoming slightly heavier at depths below 24 inches, where it frequently approximates a silt loam in texture. In low places or swales the soil is heavier and often mottled with blue

and drab, but such areas are not very extensive. Beech usually makes a vigorous growth in such locations.

The type occurs along the Ohio river as high bottom land, subject to overflow during the early spring months. This inundation occurs before the growing season, and there is generally little danger from this source during the growing or harvest seasons. The overflows add rich sediments, high in organic matter, and tend to maintain the soil in a good state of productiveness.

The topography is level to gently undulating, and with the exception of a few swales the type is well drained. It is not extensively developed in this area. The largest tract reaches from the Mason county line to Crown City Ferry.

Corn, oats, hay, tobacco, and potatoes, tomatoes and other vegetables are grown. Corn gives yields ranging from 60 to 80 bushels per acre and occupies a greater acreage than any other crop. Some oats are grown and a little rye, but the cereal crops are likely to lodge and on that account are grown to a limited extent only. Tobacco produces a leaf of excellent quality, but the acreage of this crop is at present small. Potatoes, both sweet and Irish, do exceptionally well, yielding from 200 to 250 bushels per acre. Grasses do only fairly well, but are grown over small areas. The mowing lands are good, especially in some of the wetter areas. Cowpeas and soy beans thrive. Pumpkins and squash give excellent results. Alfalfa has been grown with some success upon this type at other points along the Ohio river, but it has been more or less difficult to secure a satisfactory stand and replanting has been necessary rather too frequently. This crop does not withstand flooding as well as other grasses. Owing to its loamy structure the type is easily handled, and no difficulty is experienced in working it. It is a strong soil and fertilizers are not necessary. Thorough underdrainage of the low places would benefit the soil, and at the present price of the land would be economically justified. Intensive farming should be practiced upon this type.

The natural forest of walnut, sycamore, beech and elm has been cleared away and the type is now under cultivation. Land values range from \$100 to \$150 an acre.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Huntington loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay 0.005 to 0 mm.
220929	Central City.....	Dark-brown loam, 0 to 8 inches.	P. ct. 0.2	P. ct. 1.0	P. ct. 1.6	P. ct. 25.5	P. ct. 24.3	P. ct. 36.2	P. ct. 11.1
220930	Subsoil of 220929.	Brown loam, 8 to 36 inches.	.0	.2	.4	21.5	22.0	40.7	15.2

HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam in its typical development consists of a brown, light, fine sandy loam soil, loose and open in structure, from 8 to 14 inches deep, underlain by a light-brown, slightly compact, medium-heavy, fine sandy loam.

The structure and texture of the surface soil are fairly uniform over most of the type, but the subsoil varies greatly. Along the banks of the streams the texture is very light and in many places beds of sand are found, varying from medium to fine in grade. Swales occur in many places near the hills or second bottoms, where the subsoil approaches a silt loam in texture. Occasionally beds of sandstone and shale fragments are found underlying the surface at depths ranging from 24 to 40 inches, and in some places such beds are exposed by the removal of the surface material by stream action. In many of the narrow valleys floods have stripped the surface of soil for miles along their courses.

The type occurs at first-bottom land along the streams that head in the southern half of the area and is formed by stream deposits of material eroded from the Dekalb soils. The largest developments of the type occur above Hamlin on Mud river and above Wayne on Twelvepole creek.

The soil is not as good a soil as the Huntington silt loam, but the annual inundation serves to maintain its productiveness. The type is best adapted to the production of corn and melons. The former yields from 30 to 50 bushels per acre. Irish potatoes yield about 150 bushels and sweet potatoes from 200 to 250 bushels per acre. The type is not adapted to grass and the yield of hay averages less than 1 ton per acre. Tobacco does only fairly well. The leaf is not of the best quality, and the yields are relatively low, varying from 750 to 1,000 pounds per acre. Cowpeas and soy beans do well and should be grown more extensively. Some cover crop should be kept upon the ground to catch sediments during the spring overflow.

Fertilizers are not used upon this type and there is little need for them except where tobacco is grown. All the ordinary vegetables of the section are grown for home consumption and local markets. Near the mines trucking on a small scale may be carried successfully. The Huntington fine sandy loam is easily cultivated. There is little danger of its clodding when plowed too wet.

The natural forest growth of elm, sycamore, beech, and birch has been removed from probably more than two-thirds the area of the type and most of the cleared portion is under cultivated crops. The price of the land of this type of soil ranges from \$30 to \$60 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Huntington fine sandy loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.		Coarse sand, 1 to 0.5 mm.		Medium sand, 0.5 to 0.25 mm.		Fine sand, 0.25 to 0. mm.		Very fine sand, 0.1 to 0.05 mm.		Silt, 0.05 to 0.005 mm.		Clay, 0.005 to 0 mm.	
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
220909	One mile south of Wayne Court-house.	Brown fine sandy loam, 0 to 10 inches.	0.0	0.3	0.6	37.4	32.9	22.6	6.0							
220910	Subsoil of 220909.	Brown fine sandy loam, 10 to 36 inches.	.0	.1	2.0	47.7	27.6	16.8	5.5							
220927	1 mile southwest of Hamlin.	Brown fine sandy loam, 0 to 12 inches.	.0	.7	5.2	33.7	24.1	28.6	7.7							
220928	Subsoil of 220927.	Brown fine sandy loam, 12 to 36 inches.	.0	.8	6.0	44.4	19.5	21.1	7.6							

SUMMARY.

The Huntington area is located in the extreme southwestern corner of West Virginia and includes the counties of Cabell, Lincoln and Wayne. The total area is 803,200 acres, or 1,255 square miles.

The topography is rough and broken, except for the bottom land, river terraces and old river channels, which have a comparatively even surface. The elevation of the area ranges from about 500 feet along the Ohio river to more than 1,800 feet in places along the southern boundary.

The drainage is into the Ohio river, through Guyandot, Mud and Big Sandy rivers, and Twelvepole creek.

The first settlements of any extent were made in the early part of the last century by settlers from Virginia and North Carolina. Within recent years many have come from Ohio and Kentucky.

Huntington is the largest town and chief commercial center of the area. The other towns are much smaller and control only local trade.

Most of the population is confined to the valleys and well apportioned over the area of bottom lands. The hill land is sparsely settled, especially in the southern part of the area. A considerable proportion of the population is engaged in farming, but many are employed in lumbering, in the oil and gas fields and in the coal mines.

Oil and gas are piped out of the area in considerable quantities and large shipments of coal are made.

Areas of valuable forests still exist in the rough sections.

The facilities for shipping are excellent, both water and rail transportation being available, the latter giving direct connection with the best markets of the country.

Wheat, corn, hay, potatoes and vegetables were the principal general crops grown by the early settlers and these continue important at the present time, with the addition of sorghum, cowpeas and peanuts, which are grown to a limited extent. Tobacco now represents the main money crop of the area. Some commercial fruit growing is done. The number of cattle shows an increase over the earlier days, though little attention is paid to maintaining pure-bred stock and nearly all the animals found in the area are grades. Sheep are decreasing in numbers, but the figures for hogs show a marked increase.

The agricultural practices differ greatly over the area. In the larger stream valleys crops are more or less diversified and some truck is grown. On the hill land of the northern two-thirds of the area tobacco, hay and fruits are grown and a considerable number of stock kept. In the southern section tobacco and corn represent the principal crops and only a few cattle are carried on the farms.

Labor has been attracted from the farms by outside industries offering higher wages. Farm labor receives about \$1 a day. Very little land is rented except for the purpose of growing tobacco.

The river bottom and terrace land is held at a high figure in all parts of the area, while the hill land is cheap, even in the more thickly settled sections.

The area lies wholly within the Appalachian plateau and is divided physiographically into upland, terrace and flood plain. The upland consists of sandstone and shale formations of the Upper Carboniferous era. The weathering of these rocks gives rise to the Meigs and

Dekalb soil series, the former derived from red and gray sandstones, shales and limestones, the latter sandstone and gray shales.

The terrace soils comprise the Wheeling, Holston and Tyler series. The Wheeling soils are derived largely from glacial material, the Holston largely from sediments washed from Dekalb soils, and the Tyler is mainly wash from the Meigs soils.

The Huntington soils are river flood plain types. The loam is found on the high overflow bottoms along the Ohio river, the silt loam along the streams receiving drainage from the Meigs soils, and the fine sandy loam along streams draining areas of the Dekalb soils.

The Meigs clay loam, the most extensively developed type in the area, is a good soil for tobacco, wheat, fruit and grass.

The Dekalb silt loam is developed to a very limited extent and is best adapted to apples and tobacco.

The Dekalb stony silt loam is developed to a considerable extent in the southern part of the area and for the most part is too steep and rocky for cultivation. It is a good tobacco and potato soil and corn does fairly well on it.

The Wheeling silt loam is one of the strongest types in the area. It is well adapted to trucking and to the heavy farm crops. The Wheeling silty clay loam when properly drained has about the same crop value as the silt loam type. The Wheeling fine sand is a good melon and light truck soil.

The Holston silt loam is not a very strong soil, but produces good yields of tobacco, potatoes and beans. It is a good soil for diversified farming. The Holston silty clay loam is best adapted to grass. The Holston fine sandy loam is best adapted to melons, peas, sweet potatoes and peanuts. It is not a strong soil.

The Rough stony land, found mainly along the valley walls of the larger streams in the southern part of the area, is of little agricultural value.

The Tyler silt loam is poorly drained and is best adapted to grass. It is known locally as "crawfish land."

The Huntington loam is a good soil for corn and truck crops, such as tomatoes and potatoes.

The Huntington silt loam is a very strong soil and is best adapted to corn. More than half the cultivated area is annually planted to this crop. Tobacco yields heavily and truck crops give good returns.

The Huntington fine sandy loam is not as strong as the silt loam or loam types, but makes good yields of corn, sweet potatoes and melons.

APPENDIX

LEVELS ABOVE MEAN TIDE IN THE CABELL-WAYNE-LINCOLN AREA

Ohio River Division of the Baltimore & Ohio Railway.

Distance from Wheeling Miles	Station.	County.	Elevation above tide Feet.
172.5	Pt. Pleasant.....	Mason	570
174.2	Henderson	"	563
178.1	Gallipolis Ferry.....	"	573
179.1	Beal's Siding.....	" .....	.....
182.1	Elwell .....	" .....	.....
184.0	Ben Lomond.....	"	552
185.1	Hogsett .....	" .....	.....
187.5	Apple Grove.....	"	570
188.6	Mercer's Bottom.....	" .....	.....
189.6	Ashton .....	" .....	.....
192.5	Glenwood	"	550
194.1	Lasey's Lane.....	" .....	.....
195.6	McCurdy	Cabell .....	.....
198.0	Crown City Ferry.....	" .....	.....
200.1	Green Bottom.....	"	569
201.1	Millersport Ferry.....	" .....	.....
202.7	Lesage	"	548
205.4	Cox's Landing.....	"	548
211.2	Guyandotte	"	541
214.6	Huntington	"	538
217.3	Central City.....	"	538
221.9	Ceredo	"	545
223.0	Kenova	"	550

From Charleston to Kenova on Main Line of Chesapeake and
Ohio Railway.

Distance from Ft. Monroe Miles	Station.	County.	Elevation above tide Feet.
453.6	Charleston	Kanawha	611
455.2	Elk	"	
457.2	South Charleston.....	"	
458.9	Spring Hill.....	"	605
465.5	St. Albans.....	"	600
466.9	Lewis	"	
469.6	Scary	Putnam	
473.2	Scott	"	713
475.1	Teays	"	
479.2	Hurricane	"	700
481.5	Culloden	Cabell	
485.8	Milton	"	
490.3	Ona	"	586
491.9	Blue Sulphur Springs.....	"	
494.7	Barboursville	"	586
498.2	Wilson	"	
501.0	Guyandotte	"	586
501.2	DK Cabin	"	575
502.4	Huntington Shops.....	"	575
504.0	Huntington	"	575
505.6	Nobles	"	
506.1	Central City.....	"	548
510.2	Ceredo	Wayne	553
511.2	KV Cabin	"	560
511.3	Kenova	"	560

Guyandot Valley Branch of the C. & O. Railway.

Distance from Barboursville Miles	Station.	County.	Elevation above tide Feet.
0.0	Barboursville	Cabell	586
5.2	Martha	"	570
10.0	Inez	"	585
14.1	Salt Rock	"	591
17.4	West Hamlin	Lincoln	595
20.9	Sheridan	"	597
22.4	Branchland .....	" .....	.....
23.8	Brown City .....	" .....	.....
26.2	Midkiff	"	603
31.1	Ranger	"	618
34.7	Lattin	"	615
36.3	Gill	"	618
41.5	Eden Park	"	628
43.9	Hart's .....	" .....	.....
45.2	Ferrellsburg	"	634
50.1	Big Creek	Logan	640
51.4	Kitchen .....	" .....	.....
54.2	Chapmansville	"	653
58.6	Pecks Mill	"	665
63.3	Peach Creek .....	" .....	.....
65.2	Logan	"	687
70.4	Ethel .....	" .....	.....

Coal River Division of the C. & O. Railway.

Distance from St. Albans Miles	Station.	County	Elevation of Low Water	Elevation of Sub-Grade
0.0	St. Albans	Kanawha ..	.....	581.0
1.7	Indian .....	" ..	.....	578.0
2.5	Calvert .....	" ..	.....	591.0
4.8	Ferrell .....	" ..	.....	592.0
6.0	Upper Falls .....	" ..	.....	604.0
7.6	Lincoln .....	" ..	.....	597.5
10.2	Faqua .....	" ..	.....	602.2
11.2	Ballard .....	" ..	.....	604.0
11.9	Alum Creek .....	" ..	.....	609.0
13.0	Forks of Coal .....	" ..	.....	608.0
15.2	Sproul	" ..	582.0	610.1

Little Coal River Branch of the C. & O. Railway.

Distance from St. Albans Miles	Station.	County	Elevation of Low Water	Elevation of
15.2	Sproul.....	Kanawha ..	.....	610.1
16.7	Bluetom.....	Lincoln ..	587.0	620.0
17.2	Rolman.....	" ..	588.0	625.0
19.5	Dunlap.....	" ..	597.6	626.0
22.0	MacCorkle.....	" ..	612.0	633.0
24.3	Ivy Branch.....	" ..	.....	640.0
26.8	Altman.....	" ..	622.0	650.0
27.5	Julian.....	" ..	.....	650.0
28.2	Sayre.....	" ..	.....	650.2
30.0	Lory.....	Boone ..	.....	658.6
32.7	Rock Creek.....	" ..	639.8	668.0
33.8	Hopkins.....	" ..	.....	671.0
35.2	Danville.....	" ..	.....	674.0
37.3	Madison.....	" ..	.....	687.5

Twelvepole Branch of the Norfolk & Western Railway.

Distance from Norfolk Miles	Station.	County.	Elevation above tide Feet.
484.40	Naugatuck	Mingo	630
488.70	Lenore	"	635
492.01	Canterbury	"	675
496.53	Hale	"	880
498.85	Dingess	"	1001
501.11	Trace	"	915
507.27	Breeden	"	811
512.28	Wilsondale	Wayne	755
516.59	Doane	"	717
519.77	Wells Branch	"	701
522.27	Dunlow	"	688
527.29	Ferguson	"	666
528.89	Radnor	"	662
533.40	Genoa	"	643
536.48	Coleman	"	626
538.86	Echo	"	607
543.27	Wayne	"	598
549.30	Ardell	"	585
552.67	Dickson	"	575
555.62	Lavalette	"	561
561.38	Buffalo Creek....	"	559
566.67	Ceredo	"	565
567.92	Kenova	"	580

Big Sandy Branch of the Norfolk & Western Railway.

Distance from Norfolk Miles	M. P.	Station.	County.	Elevation above tide Feet.
484.35	0.0	Naugatuck	Mingo	630
	5.24	Kermit	"	623
	11.27	Crum	Wayne	610
	18.24	Webb	"	594
	24.71	Glenhayes	"	586
	29.90	Saltpetre	"	577
	33.79	Fort Gay	"	571
	39.14	Hewlet	"	562
	45.96	Prichard	"	561
	51.18	Cyrus	"	561
	55.23	Neal	"	561
By Big Sandy	543.51			
	59.16	Kenova	"	580
By 12-Pole	567.92			

ELEVATIONS ABOVE TIDE IN THE CABELL-
WAYNE-LINCOLN AREA, DETERMINED BY
THE U. S. GEOLOGICAL SURVEY.

ST. ALBANS QUADRANGLE.

St. Albans, West, via. Tackett Creek, to Young's Store;
Thence South to Garretts Bend; Thence Northeast
to St. Albans.

	Feet.
St. Albans, 5.0 miles west of, south of road, first house south of Young's store, belonging to John Hodges, in east chimney, 6 feet from ground; copper bolt stamped "U. S. G. S.—737."	727.294
Garretts Bend, two miles north of, Trace fork of Mud river, 200 feet below mouth of Two Mile branch, 400 feet north-west of Anderson McAllister's house, north side of stream, in huge rock; corner bolt stamped "U. S. G. S.—669"	669.125
Tornado, 1.5 miles southwest of, on road up Falls creek, on south side of road 150 feet above the first crossing of Falls creek; iron post stamped "614"	613.708

CEREDO, GUYANDOT AND MILTON 15' QUADRANGLES.

HUNTINGTON AND KENOVA 30' QUADRANGLES. CEREDO (KENOVA) QUADRANGLE.

Kenova East Along Chesapeake and Ohio Railroad, to Central City.

	Feet.
Kenova, Union Station, in west side of door sill of men's entrance to waiting room; aluminum tablet stamped "567 K".....	566.918
Ceredo, in front of station; top of rail.....	553.6
Kellogg, in front of station; top of rail.....	553.
Kellogg, 1.3 miles east of, south of track, on small culvert; chiseled square.....	564.59

Ceredo Southeast Along Norfolk and Western Railway, to Shoals.

	Feet.
Ceredo, at road crossing near station; top of rail.....	569.
Buffalo Station, 7 feet from track, in southwest abutment of bridge over Buffalo creek; aluminum tablet stamped "565 GRAFTON".....	562.455
Buffalo, in front of station; top of rail.....	563.

GUYANDOT QUADRANGLE.

Central City East Along Chesapeake and Ohio Railroad, to Barboursville.

	Feet.
Central City, in front of station; top south rail of south track	549.
Huntington, in front of station; top of rail.....	565.
Huntington, southeast corner of Tenth St. and Second Ave., between Chesapeake & Ohio and Ohio River railroads, brick building occupied in 1899 by Sehon, Blake & Stevenson Wholesale Grocery Company, in west face of stone foundation, 18.8 feet south of west corner and 1.5 feet below floor (U. S. Engineers' bench mark No. 307A).....	547.463
Huntington Court House, corner of Fourth Ave. and Eighth St., in north corner of northeast entrance; aluminum tablet stamped "566 GRAFTON".....	563.833
Wilson, at road crossing; top of rail.....	556.
Barboursville, 0.5 mile north of, 3.1 miles east of Wilson Station, in southeast abutment of railway bridge over Mud river; aluminum tablet stamped "572 ADJ 1903".....	571.760
(This bench mark was established as a substitute for one destroyed in reconstruction of bridge.)	

Shoals South Along Norfolk and Western Railway, to Wayne.

	Feet.
Shoals Station, at road crossing; top of rail.....	572.
Lavalette, in front of station; top of west rail.....	565.
Dickson Station, opposite mail crane at station; top of rail...	581.
Ardell, opposite mail crane at station; top of rail.....	588.
Ardell (Herbert postoffice), across Twelvepole creek, opposite M. E. parsonage, west of public highway, in large boulder; bronze tablet stamped "591 GRAFTON".....	588.585
Craig, in front of station; top of rail.....	597.
Wayne, 1 mile north of, on coping stone at northeast corner of culvert; chiseled square.....	588.90

Shoals Northeast, to Hodges.

	Feet.
Hodges, 125 feet north of road, opposite John Hodges' dwelling, on east of road leading to Huntington, in small boulder; aluminum tablet stamped "710 GRAFTON".....	708.184

Herbert Northeast Along Road, to Sarah, Thence North, to Barboursville.

	Feet.
Bowen, 3.8 miles southeast of, on Booton branch, 0.5 mile east of junction with Miller's branch, south of road, to boulder; bronze tablet stamped "623 GRAFTON".....	620.775
Poppa postoffice (Winslow), west of road nearly opposite post- office, in top of large boulder; aluminum tablet stamped "612 GRAFTON".....	609.584
Martha postoffice, northeast abutment of highway bridge over Guyandot river, in top stone; bronze tablet stamped "563 GRAFTON"	561.190

Poppa South, to near Bertram.

	Feet.
Bertram postoffice, 0.2 mile south of, at mouth of small run, near store, in southeast corner of foundation of old barn at W. E. Adkins; aluminum tablet stamped "643".....	642.267

MILTON QUADRANGLE.

Barboursville East Along Chesapeake & Ohio Railroad, to Hurricane, Thence Along Highway, to Young's Store.

	Feet.
Ona, in W. T. Sanford's dwelling in third stone from ground at northeast corner of foundation; bronze tablet stamped "634 GRAFTON".....	631.957

Ona, at road crossig; top of rail.....	633.
Milton, corner of Railroad and Pike St., at southeast corner of street, in foundation stone of J. S. Kane's vacant store building; bronze tablet stamped "585 GRAFTON".....	583.226
Milton, at road crossing; top of rail.....	585.
Walton, opposite switch; top of rail.....	623.
Hurricane, 0.1 mile west of station, opposite small highway bridge, north of track, in top stone of culvert; bronze tablet stamped "669 GRAFTON".....	666.688

Hamlin Southeast Along Public Highways, to Griffithsville.

	Feet.
Sweetland postoffice, 0.2 mile east of, 200 feet north of Middle Fork, north of road in bend, in rock boulder; aluminum tablet stamped "657".....	658.229

Salt Rock South Along Highways, to West Hamlin.

	Feet.
West Hamlin, 300 feet east of station, in steps at northwest corner of Baptist church; aluminum tablet stamped "595".	595.085

Ona South via. Fudges Creek and Cabell Creek to Guyandotte River at Roach.

(Single Spur Line.)

	Feet.
Fudges Creek postoffice, 5 miles south of Ona, in store chimney two stones above grade; bronze tablet stamped "736 GRAFTON"	733.360

Hurricane South,, to Nye, Thence Southwest, to Hamlin, Thence Northwest, to Sarah.

	Feet.
Nye, in top stone of northwest pier of county bridge over Trace fork of Mud river; bronze tablet stamped "625 GRAFTON"	623.468
Hamlin, in third stone from top in northeast end of abutment wall of bridge over Mud river; bronze tablet stamped "645 GRAFTON".....	642.516
Salt Rock, in third stone from top in northeast end of retaining wall of highway bridge over Guyandot river; bronze tablet stamped "586 GRAFTON".....	583.536

MIDKIFF, WARFIELD AND WAYNE QUADRANGLES

WAYNE QUADRANGLE.

Herbert Post-Office South Along Norfolk and Western Railroad, to Preston, Thence Northeast Along Public Highways, to Cove Gap, Thence North Along Public Highways, to a Point 7 Miles North of Nestlow Post-Office.

	Feet.
Herbert, 2.2 miles south of, 450 feet south of road crossing, west of railroad and road, on rock in bank; chiseled square	596.76
Wayne postoffice, in east side of, 3 feet north of main door of Wayne County Court House; aluminum tablet stamped "707"	706.639
Wayne postoffice, 3.4 miles south of, 70 feet south of railroad crossing, in northwest abutment of railroad bridge over Patrick creek; aluminum tablet stamped "607"	607.527
Sidney postoffice, in northeast abutment of iron railroad bridge over Twelvepole river at station; aluminum tablet stamped "626"	625.759
Sidney postoffice, 1.2 miles south of, 50 feet north of track, 50 feet south of Twelvepole creek, in bluff opposite slow sign, on rock; chiseled square	636.82
Genoa postoffice, 150 feet west of station, in southwest corner of culvert; aluminum tablet stamped "647"	647.323
Genoa postoffice, 3 miles south of, 40 feet west of road crossing, 300 feet north of Towdey coal mine (abandoned), in abutment of iron bridge over Twelvepole creek; aluminum tablet stamped "660"	660.071
Ferguson postoffice, 0.1 mile east of, 300 feet west of Mr. Ferguson's house, in abutment of culvert over creek; aluminum tablet stamped "668"	668.407
Quaker postoffice, 0.9 mile south of, south of road, in northwest abutment of iron bridge over Twelvepole creek; aluminum tablet stamped "685"	684.895
Quaker postoffice, 2.2 miles south of, 70 feet east of county road, 200 feet east of mile post, "N 528-C 184," on center of abutment at north end of iron bridge No. 978; chiseled square	687.44
Dunlow, 1.7 miles southeast of, 40 feet east of county road, 0.5 mile northwest of Preston postoffice, east bank of railroad, on sand rock; chiseled square	703.89
Preston, 2.8 miles northeast of postoffice, on north side of Missouri creek, 140 feet east of hollow to right, 600 feet west of foot of mountain, on sand rock; chiseled square ..	889.35
Preston, 4 miles northeast of, 300 feet west of Fork run, 150 feet west of small house, 0.6 mile west of mountain foot, south of road, north of Milam branch, in large rock boulder; aluminum tablet stamped "832"	832.334
Preston, 6.0 miles northeast of, 0.1 mile east of old dam, 0.1	

mile west of East fork, in Milam creek, on large sand rock; chiseled square.....	734.51
Spry, 0.7 mile southwest of, north of old saw mill, 0.5 mile west of mouth of Milam creek, 600 feet east of run to left and house, 10 feet north of creek, in boulder; aluminum tablet stamped "708".....	708.215
Spry postoffice, 1 mile north of, east of road; 150 feet east of Twelvepole creek, in bank, on sand rock; chiseled square	714.71
Spry postoffice, 2 miles north of, south of road on top of small summit, 100 feet north of road forks, in sand rock; aluminum tablet stamped "697".....	697.360
Kiahsville postoffice, 0.3 mile southeast of, east of road, 300 feet east of mouth of Cove creek, 300 feet from ford, in large boulder; aluminum tablet stamped "674".....	674.606
Kiahsville, 3.6 miles east of, north of Cove creek, south of road, 200 feet east of house, 800 feet east of old saw mill, in sand rock; aluminum tablet stamped "762".....	761.814
Cove Gap postoffice, 2 miles northwest of, right of road, half way down divide and road to right and private road to left in bank on edge of road, in sand rock; aluminum tablet stamped "1152".....	1152.275
Cove Gap postoffice, 3.45 miles north of, west of road, 60 feet north of road to right to Four Mile, 80 feet north of summit, on edge of road, in sand rock; aluminum tablet stamped "1178".....	1177.933
Cove Gap postoffice, 4.8 miles north of, west of road in hollow, 70 feet west of graveyard, on sand rock; chiseled square.....	1174.15
Cove Gap postoffice, 8.4 miles north of, at head of Beech Fork, 200 feet west of store at mountain foot, north of Beech run, south of road, opposite hollow, in sand rock; aluminum tablet stamped "871".....	871.146
Nestlow postoffice, 0.4 mile north of, 10 feet east of Beech creek and west of road between house, 0.2 mile north of store, on sand rock; chiseled square.....	767.42
Nestlow postoffice, 3.45 miles north of, north of road, north of Beech creek, 400 feet west of mouth of Wolfpen, 0.1 mile east of school house and church, in large boulder; aluminum tablet stamped "694".....	693.536

MIDKIFF QUADRANGLE.

West Hamlin South Along Public Highways, to Cove Gap.

	Feet.
Sheridan postoffice, 100 feet east of railroad, west to road at forks near small white house by beech tree, in sand rock; aluminum tablet stamped "601".....	601.487
Laverne postoffice or Brown City station, 70 feet west of railroad, in sandstone foundation of chimney southeast corner of house; aluminum tablet stamped "604".....	604.279
Midkiff postoffice, 1 mile south of, under fence west of railroad and road, in front of old house and store called "Rockville," 600 feet north of Ten Mile, in rock; aluminum tablet stamped "599".....	599.404

Brady postoffice, 1.8 miles south of, south of railroad, north of road, near east end of tangent, near whistle post, in sand rock; aluminum tablet stamped "609".....	608.515
Ranger postoffice, 2.05 miles south of, east of Fourteen creek by blacksmith shop, 0.4 mile south of East Fork, in outcrop of sand rock; aluminum tablet stamped "605".....	605.485

**Wewanta Southeast Along Highways, to Ferrellburg, Thence
North Along Highways, to Griffithsville.**

	Feet.
Fourteen postoffice, 0.8 mile east of, in bank half way up mountain, north of road, in sand rock; aluminum tablet stamped "1052".....	1052.353
Atensville, 0.25 mile northwest of, east of railroad between Eden Park and Atenville stations, opposite mouth of Dry Branch, in southeast end of culvert, in sandstone; aluminum tablet stamped "617".....	618.034
Fry, in south abutment of culvert, fourth stone from top (culvert over Green Shoal branch near sheet edge); aluminum tablet stamped "603".....	603.876
Fry, 2.9 miles northeast of, 300 feet north of house, 0.2 mile north of mouth of Abbott creek and saw mill, west of road, west of Big Ugly creek, in large boulder; aluminum tablet stamped "634".....	634.528
Leet postoffice, 2 miles north of, east of run, west of road, 300 feet north of foot of mountain and head of Big branch, in boulder; aluminum tablet stamped "675".....	675.825
Leet postoffice, 5.5 miles north of, south of Upton branch, 0.5 mile east of head of Upton branch, in bank near hollow, in large rock; aluminum tablet stamped "834".....	834.555
Leet postoffice, 6.75 miles north of, north of road, east of Upton creek, along edge, 300 feet north of foot of mountain, on sand rock; chiseled square.....	747.68
Spurlockville, 1.1 miles northwest of, west of road and Mud river, on edge of small summit, in sand rock; aluminum tablet stamped "726".....	727.023
Palermo postoffice, 0.4 mile northwest of, 50 feet west of mouth of Parsner creek, 50 feet north of Mud river, west of road forks, in sand rock; aluminum tablet stamped "691".....	692.360
Bernie, 0.8 mile west of, east of Parsner creek, in bank opposite hollow, on rock; chiseled square.....	751.65
Bernie postoffice, 0.1 mile west of, north of Parsner creek and road, opposite old saw mill, in large sand rock; aluminum tablet stamped "807".....	808.062
Bernie postoffice, 3 miles north of, east of road, east of Sycamore branch, on top of small hill, opposite house, in rock cliff; aluminum tablet stamped "715".....	716.099
Bernie postoffice, 3.8 miles north of, east of road, east of Sugar Tree, opposite house and hollow on rock cliff; chiseled square	664.608

Griffithsville Northwest to Hamlin.

	Feet.
Griffithsville postoffice, 1 mile northwest of, west of road, west of Middle Fork, in bank on small hill, in rock cliff; aluminum tablet stamped "667".....	668.319
Griffithsville postoffice, 3.4 miles northwest of, east side of Middle Fork creek, at south of Scary creek, on sandstone; chiseled square.....	648.60

WARFIELD QUADRANGLE.

Near Warfield.

	Feet.
Preston, 0.6 mile east of, 800 feet east of Wells Branch station, in northwest abutment of bridge No. 975 over Missouri branch's mouth; aluminum tablet stamped "704".....	704.665

NAUGATUCK QUADRANGLE.

Nolan Northwest Along Norfolk & Western Railway to Yorkville.

	Feet.
Nolan, 2.3 miles northwest of, 130 feet northwest of road crossing, 100 feet west of mile post 480, 70 feet north of deserted house in sandstone boulder 15x108x10 feet; aluminum tablet stamped "645".....	644.777
Naugatuck, at east end of siding, 25 feet south of railroad 100 feet west of old road crossing, in sandstone culvert; aluminum tablet stamped "638".....	637.728
Naugatuck, 0.9 mile northwest of, 10 feet south of road crossing on sandstone rock, chiseled square; warning post marked "U. S. B. M. 635".....	634.62
Naugatuck, 1.9 miles northwest of, 200 feet north of railroad crossing, 75 feet west of wagon road in sandstone rock aluminum tablet stamped "639".....	638.508
Naugatuck, 3.4 miles northwest of, 60 feet east of tunnel, on south side of tracks, on sandstone rock; chiseled square..	629.98
Kermit, at road crossing at milepost, east of, on north side of railroad, on west side of wagon road, on sandstone rock; chiseled square, marked "628".....	628.03
Kermit, 600 feet east of station, on west side of sandstone culvert, in third tier of stone below top; aluminum tablet stamped "623".....	622.640
Kermit, in front of station; top of rail.....	627.8
Kermit, 2.5 miles northwest of, 100 feet north of railroad, 300 feet northeast of railroad crossing, 50 feet north of wagon road, 5 feet south of gate in sandstone rock; aluminum tablet stamped "621".....	620.505

Crum, 0.3 mile east of, 50 feet north of railroad, on south side of county road, 100 feet northwest of mile-post "Naug. 11" in sandstone boulder; aluminum tablet stamped "619" ..	618.902
Crum, 1.95 miles northwest of, 750 feet west of mouth of tunnel on north end of west abutment of railroad bridge 755 over Bull creek; chiseled square, marked "611"	610.97
Jennie, 10 feet south of northwest entrance to railroad tunnel, 150 feet east of road crossing; aluminum tablet stamped "615"	614.526
Millett, 1.6 miles northwest of, in east end of north abutment of railroad bridge 756 over Camp creek; aluminum tablet stamped "603"	602.200
Webb, in front of station, top of rail	600.5
Webb, 1.8 miles northwest of, 105 feet north of mile-post "Naug. 20" on north side of wagon road, on east side of Coon Hollow, in sandstone rock; aluminum tablet stamped "594"	594.105

Near Preston.

	Feet.
Preston, 0.6 mile east of, 800 feet east of Wells Branch station, in northwest abutment of bridge 975 feet over Missouri Branch mouth; aluminum tablet stamped "704"	704.665

Naugatuck North Along Old Line of Norfolk & Western Railway to Point 0.8 Mile North of Canterbury.

	Feet.
Naugatuck, 230 feet north of station on northeast foundation for east water tank. Chiseled square, marked "636"	635.66
Blocton, in front of station, top of rail	633.8
Blocton, 0.3 mile east of, 110 feet east of road crossing, 8 feet south of railroad track; chiseled square on large sandstone rock marked "U. S. B. M. 637"	636.65
Blocton, 1.7 miles east of, 10 feet north of railroad, chiseled square on sandstone ledge marked "640"	639.98
Blocton, 2.4 miles east of, 1,150 feet west of Eugene P. O., 35 feet south of road crossing, in sandstone rock; aluminum tablet stamped "634"	633.900
Eugene, in front of station, top of rail	638.8
Lenore, in front of station, top of rail	641.
Lenore, 1 mile northeast of, 12 feet west of railroad track, chiseled square, on sandstone in small hollow to west	643.33
Rapp, in front of station, top of rail	646.
Lenore, 2.6 miles northeast of, top of east end of north abutment of railroad bridge 939	666.93
Lenore, 3 miles north of, in east bridge seat of north abutment of railroad bridge 941; aluminum tablet stamped "672"	672.066
Canterbury, at water tank; top of rail	686.
Canterbury, 0.8 mile north of, railroad bridge 942 over Tom run, west end of north abutment	699.20

Point 2.2 Miles South of Breeden, Northwest Along
Norfolk and Western Railroad to Preston.

	Feet.
Kirk, in front of station, top of rail.....	873.
Buttercup, in front of station, top of rail.....	867.
Breeden, 2.2 miles southeast of, top of east end of south abutment of railroad bridge 951.....	856.61
Breeden, 1.1 miles southeast of, 5 feet west of railroad track in cut on sandstone rock; chiseled square.....	837.85
Breeden, 800 feet east of, in top of south end of east abutment of railroad bridge 956; aluminum tablet stamped "818"...	818.378
Breeden, in front of station, top of rail.....	816.
Wilsondale, 3.3 miles southeast of, on south end of east abutment of railroad bridge 960 at branch to north, chiseled square	798.36
Wilsondale, 2.7 miles southeast of, on south end of east abutment of railroad bridge 964 over Poor branch; chiseled square	786.42
Mingo-Wayne County line; top of rail marked "780".....	780.
Wilsondale, 1.8 miles southeast of, 8 feet north of railroad and 740 feet west of Mingo and Wayne County line in sandstone ledge; aluminum tablet stamped "781".....	780.979
Wilsondale, 300 feet west of, 10 feet north of railroad track; chiseled square on sandstone rock.....	761.34
Doane, 3 miles southeast of, in top of west bridge seat of south abutment of railroad bridge 967 over Gourd Branch; aluminum tablet stamped "746".....	745.901
Doane, 2.6 miles southeast of, 30 feet south of railroad track, 100 feet west of mile-post "N 514"; chiseled square on sandstone rock.....	718.78
Doane, 1.4 miles southeast of, on west end of railroad bridge 971 over Twelvepole creek; chiseled square.....	738.76
Doane, 0.4 mile east of, 10 feet north of railroad track in sandstone rock; aluminum tablet stamped "722".....	722.375
Doane, in front of station, top of rail.....	721.
Wells Branch, 2 miles southeast of, on east side of north abutment of railroad bridge 974 over Arkansas Branch; chiseled square.....	717.87
Wells Branch, 1.1 miles southeast of, 10 feet north of railroad track, chiseled square on sandstone ledge.....	711.64
Preston, 0.6 mile east of, 800 feet east of Wells Branch station, in northwest abutment of bridge 975 over mouth of Missouri Branch, aluminum tablet stamped "704".....	704.665

MADISON 15' (CHARLESTON 30') QUADRANGLE.

Robinson Creek West via. Pond Fork, Little Coal River, Peter Cove Fork and Sulphur Springs Fork to Griffithsville.

	Feet.
Madison post-office, in west side of foundation of Boone County Jail; aluminum tablet stamped "704".....	703.221

Madison post-office, 1.1 miles west of, southeast of railroad, 500 feet southwest of mile post No. 1 on outcrop of sand rock; chiseled square.....	693.12
Danville post-office, 0.5 mile west of, 300 feet west of brick yard, 10 feet west of county road, 10 feet south of railroad, on south abutment of culvert at mouth of John Hill Branch, chiseled square; painted "686".....	684.50
Danville, 1.5 miles west of, 90 feet west of Hopkins station, 500 feet north of mile-post No. 3 between house and railroad, in east end of foundation of Mr. Hopkins' cellar; aluminum tablet stamped "679".....	677.402
Danville postoffice, 4.5 miles northwest of, west of railroad, 300 feet west of county road, between houses, in west abutment of culvert; aluminum tablet stamped "666"....	664.384
Danville post-office, 6.5 miles northwest of, right of railroad, 0.2 mile northwest of mile-post No. 8, on rock cliff, chiseled square; painted "669".....	668.03
Hill post-office, 600 feet west of, south of railroad, 200 feet west of trestle, 600 feet from road crossing and station in rock cliff; aluminum tablet stamped "667".....	665.404
Hill post-office, 2 miles northwest of, west of road, near small summit, 500 feet east of house, on outcrop of sand rock, chiseled square; painted "658".....	657.27
Woodville post-office, 300 feet east of, 3 miles west of Hill post-office, 170 feet north of mouth of Laurel creek, right of road, in rock boulder; copper bolt stamped "673".....	672.622
Woodville post-office, 2.4 miles west of, 600 feet north of Sulphur fork at its mouth, east of road and run, in top of boulder; aluminum tablet stamped "772".....	770.923
Woodville postoffice, 3.3 miles northwest of, north of road, 600 feet north of Gum run, on rock, chiseled square; painted "831".....	829.65
Woodville post-office, 4.2 miles northwest of, north of road, on top of mountain, on rock, chiseled square; painted "1063".....	1061.82
Woodville post-office, 5.8 miles northwest of, opposite hollow, 40 feet off road in field, opposite hollow, 300 feet west of house, in outcrop of rock; aluminum tablet stamped "826".....	824.747
Woodville post-office, 7.4 miles northwest of, north of Sugar-tree run, north of road, 300 feet east of house, on outcrop of rock, chiseled square; painted "706".....	704.66
Woodville post-office, 9.1 miles northwest of, at foot of hill, west of road, north of run, on small rock, chiseled square; painted "671".....	670.39

Garretts Bend South via. Sandgap, Sugar Camp Knob and Hill, to Madison.

	Feet.
Sand Gap, 500 feet west of forks of road, in huge rock above John A. Midkiff's house; copper bolt stamped "U. S. G. S.—1079"	1078.545
Hill post-office, 3 miles west of, 200 feet above confluence of Laurel fork and Horse creek, opposite James McClure's house near last crossing of Laurel, on east bank, in rock ledge; copper bolt stamped "U. S. G. S.—673".....	672.622

- Hill post-office, 2 miles north of, 1 mile above mouth of Trace branch, on left side of right hand hollow on Trace branch of Horse creek; copper bolt stamped "U. S. G. S.—766" .. 765.931
- Hill post-office, 3 miles southeast of, 0.25 mile north of Camp creek, on east side of road going up Little Coal river, 300 feet above B. Stelling's, in small ledge of rock; copper bolt stamped "U. S. G. S.—660"..... 660.170

GLENWOOD QUADRANGLE.

Glenwood South Along Highway, to Swann; Thence Northeast, to Albatross; Thence North, to Derby.

	Feet.
Glenwood, 2.84 miles south of, east of road, in face of rock outcrop, aluminum tablet stamped "592 ADJ 1903".....	591.944
Glenwood, 5.9 miles south of, west of road, in face of rocky cliff; aluminum tablet stamped "587 ADJ 1903".....	587.029
Swann post-office, 0.1 mile north of, near church at northeast angle of forks of roads, under chestnut tree, on top of large stone; chiseled square.....	830.158
Swann, 2.3 miles east of, north of road, in face of rock ledge; aluminum tablet stamped "577 ADJ 1903".....	577.045
Bryan, 0.6 mile northeast of, north of road, east end of face of rock cliff; aluminum tablet stamped "837 ADJ 1903"...	837.152

INDEX.

	Page
Abbreviations.....	35, 289, 311
Adkins, A., No. 16.....	330
Adkins, Caleb, mine.....	191, 404-5
Adkins, Chapman, No. 4.....	372
Adkins, E. E., No. 104.....	326, 362
Adkins, Ella.....	326
Adkins, Frank, mine.....	119, 193
Adkins, G. M., No. 6.....	328
Adkins, Kirby, mine.....	177
Adkins, Lucian, No. 5.....	372
Adkins, Manley, mine.....	200
Adkins, Melissa, mine.....	250
Adkins, Millard.....	372
Adkins, Mordecai, mine.....	191, 404-5
Adkins, Randolph.....	245
Adkins, R. J., mine.....	105
Adkins, Samuel, mine.....	250, 404-5
Adkins, Scott, No. 1.....	372, 381
Adkins, William, mine.....	252
Agriculture.....	429
Akers, David, No. 1.....	290
Akers, John, No. 1.....	292
Akers, J. W., No. 1.....	303
Aliff, Sylvester, mine.....	107, 404-405
Allegheny series, Coals.....	397-400
Allegheny series, Description.....	143-224
Allegheny series, Flora.....	223
Allen, A.....	330
Altizer well.....	294
Altizer, Wm., mine.....	124
Altstaetter, F. W.....	2
Ames limestone.....	129-134
Analyses of coals.....	404-405
Analyses of fire clay.....	82, 410, 412
Analyses of limestones.....	119, 122, 123, 127, 128, 131, 181-182
Anticlines, Description of:	
Branchland.....	279
Byrnside.....	279
Doane.....	278
Area by Districts:	
Cabell county.....	5
Lincoln county.....	13
Wayne county.....	18
Arkansas Branch section.....	73
Arnold mine.....	186
Arnoldsburg sandstone.....	97
Ashland, Ky.....	25
Available coal, Summary.....	403

B

Baker, Albert.....	244
Baker, W. W., mine.....	165, 404-405
Baker, W. W., No. 1.....	330
Bakerstown coal.....	136
Ball, Cora, mine.....	222
Baltimore & Ohio R.R.....	5
Ohio River Division.....	458
Barboursville, Acct. of.....	11
Barboursville Clay Mfg. Co.....	414
Barboursville district:	
Area of.....	5

Sections.....	Page
Well records.....	294, 305-307
Barrett, Thos., No. 68.....	312
Barton coal.....	136
Bayes, Isaac.....	50
Bays, M. A., Nos. 1-6.....	312
Bear Branch mine.....	242
Beckelheimer mine.....	176
Beckett, C. C., Nos. 1, 2, 3.....	290
Beckett, D. J.....	324
Beckett, E. W., Nos. 1-6.....	290-297
Beckett, H. L., mine.....	103
Beckett, No. 1.....	286
Beckett sand.....	286
Bedell well.....	39
Beech fork.....	30
Beechy Branch section.....	151, 217
Beede, Dr. J. W.....	132
Bell, E. P., Nos. 1-6.....	316
Bell, E. P., No. 7.....	318
Bell, Fanny, Nos. 1 & 2.....	324
Bell, Fanny, No. 3.....	322
Bell, Oscar, Nos. 1-6.....	324, 349, 350
Bell, W. F., Nos. 1-6.....	318
Belmont coal.....	235
Berea sand.....	287
Berkeley, T. J., Nos. 1-10.....	290
Bias, W. C., mine.....	120
Big creek, Coal on.....	167, 248
Big creek, Limestone on.....	127
Big creek section.....	50, 64
Big Hurricane section.....	140
Big Injun sand.....	286
Big Laurel creek mine.....	218
Big Lime.....	285
Big Red Cave.....	135
Big Sandy railroad.....	4, 462
Big Sandy river.....	3, 31
Big Ugly creek mines.....	270
Bills, W. F., mine.....	180
Birmingham shale.....	129
Ping, Birt, No. 1.....	372
Black, A. F., No. 1.....	324, 366
Black Flint ledge.....	25
Black, Geo. A., No. 1.....	324, 365
Black, Wm., mine.....	168, 404-5
Black, W. T., No. 119.....	330
Blake, Thos.....	290
Blankenship, W. C., mine.....	107
Block Coal Co., mine.....	273
Bobs Branch section.....	69
Roone Co., Coal Corp.....	404-5
Boothe, C. & R., No. 48.....	326
Boothe, P. & C., Nos. 66 & 103.....	326
Bowen creek section.....	91
Bowen, David, mine.....	106
Bowen section.....	111
Boyd Co., Ky. section.....	79, 272
Brady, E. W., No. 2.....	300
Bragg, Calaway, mine.....	198, 404-5
Bralley, E. W., Nos. 2, 3, 4.....	290
Bralley, E. W., Nos. 1, 5-11.....	292
Bralley, Henry.....	292

	Page
Branch, J. R., Nos. 185, 191, 193, 197.....	326, 358-9
Branchland, Acct. of.....	16
Branchland anticline.....	279
Branchland C. Co., Nos. 184 & 186.....	361
Branchland C. Co wells.....	235, 245-7, 404-5
Branchland mine.....	244
Branchland oil field.....	281
Branchland section.....	57
Brewer, N., wells.....	328
Briles, A., No. 73.....	330, 360
Brogan, Walter.....	236
Brooks, A. B.....	419
Brown, Jas., No. 1.....	318
Brumfield, John, mine.....	242, 404-5
Brumfield, Paris, mine.....	256
Bruntz, Thos.....	326
Brush Creek coal.....	139, 397
Brush Creek limestone.....	132, 139
Brushy fork section.....	144, 183
B. T. U., Definition of.....	393
Buffalo sandstone.....	138
Building stone.....	417
Bulger section.....	62
Burger, Ira.....	326
Burger, I. L., No. 138.....	357
Burns, C. E., No. 3.....	290
Burns, C. E., Nos. 1, 2, 4-8.....	292
Burnside, G. W., Nos. 1 & 3.....	284
Burnside, G. W., Nos. 1, 2 & 3.....	312
Burton, Benj., wells.....	322, 328
Butler district sections.....	76-78, 146, 156, 178, 222
Butler district well records.....	372-374
Byrnside anticline.....	279

C

Cabell county:	
Area by districts.....	5
Coals, available.....	395-403
Description of.....	5
Elevation of.....	5
Farm products.....	6
Little Pittsburgh coal.....	119
Pittsburgh coal.....	100-109
Population.....	6
Sections.....	35-48, 84-93
Timber.....	419
Towns.....	8
Valuation of property.....	7
Well records in.....	288-310
Well records, Summarized.....	290-295
Caldwell, Bell, mine.....	221
Caldwell-Colton No. 1.....	385
Caldwell, Elizabeth, mine.....	217
Caldwell, J. L., mine.....	175
Caldwell, J. L., wells.....	294, 326
Camden Interurban road.....	5
Campbell, M. R.....	25, 223
Campbells Creek coal.....	273
Campbells Creek limestone.....	272
Carroll district:	
Area of.....	13
Mines in.....	164-169
Sections in.....	55, 95
Well records.....	324, 330, 364-6
Carter, J. D.....	290
Carter No. 2.....	292
Casdorph well.....	312
Cassville Plant shale.....	83
Castell, Nora, mine.....	252

Cedar Grove coal.....	Page 272
Central City section.....	38
Ceredo, Acct. of.....	20
Ceredo district mines.....	176
Ceredo district sections.....	68-70, 112-114, 137
Ceredo district wells.....	372, 374
Ceredo quadrangle.....	463
Chambers, C. C., No. 1.....	322
Chaney, T. A., No. 1.....	292
Chapman, Elijah.....	292
Chapman, German.....	292
Chapman, Taz., No. 1.....	290
Chapmansville dist., sections.....	64
Charleston sandstone.....	234
Charley Creek section.....	46
Chert boulders.....	25
Chesapeake & Ohio R. R.:	
Coal Valley R. R.....	4, 460
Guyandot Valley Branch.....	4, 460
Levels.....	459
Main Line.....	3
Well record, No. 1.....	294, 308
Childers, John, mine.....	103
Chilton coal.....	269-72, 404-5
Chilton mine.....	269
Chimney Towers.....	255
Christian, J. J.....	294
Cincho Branch section.....	162
Clark, Alice, wells.....	330
Clark, Dora, No. 1.....	318
Clark, John, mine.....	102
Clark, J. W.....	292
Clark, Peter, mine.....	207, 404-5
Clarksburg limestone.....	122, 123
Clarksburg, Little, coal.....	122
Clay, J. R., mine.....	194, 404-5
Clay, Hurston, No. 4.....	364
Clays of area.....	409-16
Climate.....	427
Clover section.....	80
Coal, Chapter on.....	397-408
Coal, Method of sampling.....	393
Coal, Minalbe.....	394-403
Coal Production, Statistics of:	
Lincoln and Wayne.....	390-94
Order of counties.....	391
Coalburg coal.....	256, 401, 404-5
Coalburg, North, coal.....	183
Coalburg sandstone.....	255
Coal River O. & G. Co.....	45
Coal River R. R.....	4, 460
Coals of Allegheny series.....	397-400
Coals of Conemaugh series.....	117, 396
Coals of Dunkard series.....	81
Coals below Lower Kittanning.....	162
Coals of Monongahela series.....	394-96
Cobbs creek, Limestone on.....	128
Cobbs creek section.....	64
Collins No. 78.....	372
Colored Orphans Home mine.....	124
Colton, Caldwell.....	372
Conemaugh series, Description of.....	110-142
Conemaugh series, Formations of.....	117, 396
Conemaugh series, Marine fossils of.....	132
Connellsville sandstone.....	121
Connor, Adam.....	292
Connor, C. C., No. 1.....	292
Connor, John, Nos. 1-3.....	292
Connor, Joseph, No. 1.....	292

	Page
Connor, W. W., Nos. 1-3.....	290
Connor, W. W., No. 3.....	292
Contour intervals.....	276
Cook & Evans, Nos. 188, 189 & 196.....	326
Cooper, Thos., Nos. 1-4.....	314
Core tests:	
East Lynn Nos. 1, 2, & 3.....	376-377
Ferguson, Geo., No. 2.....	230
Meyers heirs.....	77, 375
Webb, Mont.....	229
Courtney, D. G., mine.....	199, 200, 404-5
Courtney, D. G., No. 1.....	330, 356
Cove creek mine.....	257
Cove Gap, Coal near.....	125
Cove Gap section.....	115
Crane, C., & Co., No. 1.....	294, 308
Crawford, W. H., section.....	139
Crinoidal coal.....	134
Crinoidal limestone.....	129
Crockett, J. H.....	372
Cross, Columbus, mine.....	262
Crown City Ferry section.....	42, 87
Crumm mine.....	273
Crumm, Sam'l.....	372
Crumm section.....	228
Culloden.....	11
Culloden clays.....	413
Cummings mine.....	262
Curnes, J. W., Nos. 2-4.....	316
Curry dist., sections.....	50
Cuzzie section.....	154
Cyrus, C. C., mine.....	108
Cyrus, Fossils from.....	132
Cyrus section.....	113

D

Dalton, Jas., mine.....	249
Davis creek, Coal on.....	124
Davis, John, No. 1.....	380
DeBarry mine.....	222
Dekalb silt loam.....	438
Dekalb stony silt loam.....	440
Devonian rocks.....	35
Dial, Almeda.....	246
Dial, Almeda, Nos. 184 & 186.....	326
Dial & Burgess No. 183.....	326
Dial, Freeland.....	245
Dial, J. M., coal opening.....	176
Dial, J. N., No. 76.....	362
Dias, Henry, mine.....	261
Dillon, J. C., No. 1.....	294, 310
Dingess, Jas., No. 1.....	330, 335
Doane anticline.....	278
Doane section.....	147
Dogbone branch mine.....	173
Dotson, A. T., mine.....	194, 404-5
Dotson, A. T., well.....	330
Dotson, Thos., mine.....	193
Drainage Basins, Description of.....	27-32
Drown, H. T. & H. S.....	134
Dry Creek section.....	89
Dunkard series.....	81-83
Dunlow, Acct. of.....	22
Dunlow mine.....	259
Dunlow section.....	72
Duval district:	
Area of.....	13
Mines in.....	169-171, 188-190, 239-243
Sections in.....	49, 52-53, 64, 94, 144, 159
Well records.....	312-394, 330, 338-355
Dyre, Meredith.....	372
Dyre, M. F.....	372

E

	Page
East End Land Co.....	40, 290
East fork.....	31
East Lynn, Acct. of.....	22
East Lynn Coal Co.....	
.....143, 185, 209, 372, 404-5	
East Lynn mine.....	213
East Lynn sandstone.....	183
East Lynn section.....	143
East Lynn well.....	377
Echo Coal & Gas Co. mine.....	222
Echo Oil & Gas Co., core tests.....	229-231
Edwards, T. J.....	294
Edwards, W. S.....	35, 44
Egnor, J. M., Nos. 1, 2, 25, 26, 29, 328	
Egnor, Milton, mine.....	242, 404-5
Egnor, S. A., mine.....	195, 404-5
Elk Lick coal.....	124, 396, 397, 404-5
Elk Lick limestone.....	127, 128
Elm Grove limestone.....	33
Eloise section.....	149
Ely fork mine.....	236
Ely, G. W., mine.....	126, 404-5
Erwin & Kane No. 1.....	292

F

Ferguson, James, mine.....	223, 404-5
Ferguson mine.....	253, 259
Ferguson section.....	151
Ferguson, S. J., mines.....	219, 220, 404-5
Ferrellsburg syncline.....	279
Flat creek mines.....	192, 199
Flatwoods.....	25
Fleming section.....	156
Flora of the Allegheny series.....	223
Foble, Oscar.....	290
Forests.....	419-423
Fort Gay, Acct. of.....	21
Fort Gay, Fossils from.....	132
Fort Gay section.....	76, 411
Fossils of Conemaugh series.....	130
Fourteen Mile mines.....	263
Fourteen P. O. section.....	67
Fowler, B. F., mine.....	250
Fowler, Joab, Nos. 1-6.....	316
Fowler, John.....	314
Fowler, Robt, Nos. 1-4.....	316
Fowler, Thos., Nos. 1-6.....	314
Fraley, Commodore.....	372
Franklin, O. F.....	326
Frasher, Frank.....	372
Frazier, T. F. well.....	350
Freeport, Lower, coal.....	180, 383, 404-5
Freeport, Lower, limestone.....	181
Freeport, Upper, coal.....	
.....163-179, 397-8, 404-5	
Freeport, Upper, sandstone.....	179
Fruitel, Chris., Nos. 1-6.....	292
Fry, John, mine.....	211
Fry, W. E., mine.....	271
Fudges Creek section.....	90
Fuquay creek mine.....	171

G

Garrets Bend section.....	55
Garrett well.....	312
Gartner, Albert, mine.....	267, 404-5
Garten branch mine.....	265
Geary, R. A., well.....	39
Genoa Oil & Gas Co.....	230
Genoa section.....	229

	Page
Geologic accidents.....	23
Geologic formations.....	35
Geologic structure, Chapter on.....	275-280
Geology, General.....	34-80
Geo-syncline.....	277
Gerlock, Henry.....	292
Gilboy sandstone.....	96
Gilkerson, John, mine.....	181, 404-5
Gill, Joseph, mine.....	256
Glacial effects.....	24
Glass Lick run, Coal on.....	108
Glenhayes Co., Nos. 1 & 2. 75, 372, 385	
Glenhayes Land Co. mines.....	222, 268, 404-5
Glenhayes section.....	75
Glenwood quadrangle.....	473
Goode, L. V., mine.....	171
Goodykoontz, Wells.....	229
Grafton sandstone.....	129
Graham, J. W., mine.....	107, 404-5
Grant district:	
Area of.....	5
Coal openings.....	214-219, 252-255
Sections in.....	
35-36, 40-46, 84-90, 115, 147, 149-151	
Well records.....	290-294, 296-305, 372, 381-383
Grass, A. G., Nos. 2-7. 312, 320, 343, 344	
Grass, J. M., Nos. 1-4.....	312
Gravel pits.....	417
Green Bottom section.....	41
Greenbrier limestone.....	285
Griffith, Austin, wells.....	312, 344
Griffith, Columbus, Nos. 1-3.....	316, 345
Griffith, E. G., Nos. 1-3.....	316
Griffith, E. G., Nos. 4-7.....	316
Griffith, Emma, Nos. 1-6.....	312, 354
Griffith, Ephriam, Nos. 1-5.....	316, 346
Griffith, G. N., No. 1.....	324
Griffith, H. B., No. 1.....	324
Griffith, J. A.....	312
Griffith, M. A. & T. A., Nos. 1-18.....	31, 318
Griffith, W., No. 1.....	324
Griffithsville, Acct. of.....	16
Griffithsville oil field.....	281
Griffithsville section.....	49
Griffithsville syncline.....	279
Guffey & Queen.....	228
Guinn, John.....	404-495
Guinn, T. J.....	290
Guyan Nos. 4-6, 18 and 23.....	285, 336, 379, 381, 383
Guyandotte & Charleston Turnpike.....	5
Guyandotte district:	
Area of.....	5
Sections in.....	33, 42, 92
Well records.....	294, 307-309
Guyandotte Land Assn. mines.....	
176, 178, 204, 205, 210, 214-216,	
218, 246, 249, 260, 264, 270, 271,	
404-5	
Guyandotte Land Assn., Nos. 1, 2,	
5, 6, 14, 23, 28, 29, 30, 47, 51,	
64, 74 & 110.....	328
Guyandotte Land Assn., Nos. 3, 4,	
5, 13, 16, 36, 42, 45, 79, 109,	
102, 194.....	330, 367
Guyandotte Land Assn., Nos. 8 &	
24.....	382
Guyandotte Land Assn., Nos. 10,	
11, 13, 15, 39, 49, 53, 57, 69,	
76, 83, 85, 93, 103.....	326, 363
Guyandot river.....	2, 25
Guyandotte Valley Br. C. & O. R.	
R.....	4, 460
Guyandotte, Acct. of.....	12
Guyandotte quadrangle.....	463

H

Hager, A., Nos. 1-3.....	522
Hager, Elbert, mine.....	198
Hager, H. A., Hrs. Nos. 1-12.....	320
Hager, Louisa, mine.....	248
Hager, Octave, No. 1.....	312
Hager, Octave, Nos. 2 & 3.....	320
Hall, Jas.....	324
Hamlin, Acct. of.....	15
Hamlin section.....	55
Handley, John, No. 1.....	299, 300
Handley, Sam'l.....	294
Harbour, Chas.....	292
Harkins, Geo., mine.....	101
Harless, A., No. 46.....	326
Harlem coal.....	134
Harsbarger Nos. 1 and 3.....	290, 294, 302
Harsbarger, I. J., No. 1.....	113
Harsbarger, J. & J. H., Nos. 1 &	
2.....	590
Harshbarger & Kane No. 2.....	292
Harshbarger, T. & J. H., No. 2.....	294
Harts Creek district:	
Description of.....	13
Mines.....	202-6, 248-251, 264-6, 270
Sections.....	59, 66, 226
Well records.....	330, 367-9
Harts Station section.....	225
Harvey, T. H.....	294
Harvey well.....	38
Hatfield, W. G., Nos. 56 & 72.....	326
Hayes, Harry, No. 182.....	326
Heaths Creek section.....	91
Heck & Sons.....	413
Hedges, Wm., mine.....	266
Hencekohn, Chas.....	101, 404-405
Hendricks, Thos., well.....	294, 305
Hennen, Ray V.....	82, 97
Hense Branch mine.....	201
Hilbert, A. C., No. 1.....	320
Hilbert, A. C., Nos. 2-5.....	318
Hilbert, A. S.....	312
Hill, Albert, Nos. 1-3.....	320
Hill, H. H., mine.....	239
Hill, Ira, No. 1.....	320
Hill, O., Nos. 1-6.....	314
Hill, Wilburn, mine.....	198, 404-5
Hill, Wm., mine.....	195, 404-5
Historical & Industrial develop-	
ment.....	1-22
Hite, B. H.....	82, 393
Hodge, E. & A.....	326
Hodges section.....	42
Holden coal.....	273
Holderby, Mrs. E. S., Nos. 1 & 2.....	326
Holley, Job.....	324
Holley O. & Dev. Co.....	55
Holley & Stephenson.....	50
Holley, Tobias.....	330
Hollins Branch mine.....	104
Holstein, L. E., Nos. 22, 23, 28, 47.....	328
Holstein, L. E. & E. B., Nos. 1-6.....	328
Holston fine sandy loam.....	450
Holston silt loam.....	447
Holston silty clay loam.....	449
Holton, Jas., Nos. 1-3.....	314

	Page
Homewood sandstone.....	233
Hooker Knob section.....	74
Hoover, Jesse, mine.....	202
Hoover, Jesse, well.....	330
Horse Cr. C. & L. Co. mines.....	
.....189, 190, 239, 404-5	
Horse Cr. C. & L. Co. wells.....	324
Horse Creek No. 1.....	320, 339
Horse Creek No. 7.....	328
Howett section.....	85
Hubbardstown mine.....	179, 181
Hubbardstown section.....	77
Huddleston Knob section.....	88
Hudson, Alice, No. 1.....	318
Huffman, R., mine.....	173
Huffman, R., Nos. 1 and 2.....	314, 316
Hughes, J. H., No. 1.....	290
Huntington:	
Account of.....	8
Miscellaneous industries.....	10
Population.....	8
State Institutions.....	8-10
Huntington fine sandy loam.....	454
Huntington loam.....	453
Huntington section.....	92
Huntington silt loam.....	452
Huntington tile.....	135
Hutchinson, Jas.....	372
Hutchinson, W. B.....	294

I

Island Creek section.....	140
---------------------------	-----

J

Jackson Branch section.....	148
Jefferson district:	
Mines.....	173-4, 192-201, 239-243
Sections.....	60-63
Well records.....	328-30, 335-38
Jenkins, J. W., well.....	294, 296
Joels Branch section.....	156
Joes creek, Mines on.....	171
John Branch section.....	85
Johnson, Belle, mine.....	206
Johnson Bros. mine.....	245
Johnson, Galleher.....	292
Johnson, J. A., well.....	312
Johnson, J. H., mine.....	105
Johnson, Lucian S.....	3
Johnson, Sadie, No. 1.....	290
Johnson section.....	115
Johnson, W. H.....	324
Jones wells.....	320
Julian section.....	145

K

Kanawha river.....	24
Kanawha series.....	226, 233
Kavanaugh section.....	79
Keaton, I. W.....	292
Keaton, Preston.....	292
Keck, W. T., No. 44.....	326
Keeling, Wm., No. 1.....	314, 346
Keeny, Chas., No. 1.....	324
Kceny, Mary, Nos. 1 & 2.....	328, 339
Kceton, Ernest, mine.....	168, 404-5
Kcenny, Neri, No. 1.....	339
Kcnova, Act. of.....	21
Kcnova Land Assn.....	372
Kcnova section.....	68

	Page
Kerns, Benj., Nos. 1 & 2.....	314
Kerns, Will, No. 1.....	314
Key rock.....	275
Keyser, Luther, mine.....	108
Keyser, Thos., mine.....	120, 404-5
Kilgore, G., Hrs. Nos. 1 & 3.....	290
Kilgore Hrs. No. 2.....	290
Kilgore, J. W., Nos. 2 & 3.....	290
Kilgore, R. C., Nos. 1, 2, 4 & 5.....	46
Kilgore section.....	84
Kindle, Mary, Nos. 1 & 2.....	292
King, A., No. 21.....	342
King, John.....	328
King, J. L., Nos. 12, 24 & 41.....	322
King, J. L., Nos. 5, 8, 9, 21, 30,	
42, 48-50.....	320, 341, 342
Kingery, Bird, mine.....	170
Kingery, Creed, Nos. 1-4.....	320
Kittanning, Lower, Coals below.....	162
Kittanning, Middle and Lower.....	184
Kittanning, Upper, coal.....	183
Knowlton, Dr. F. H.....	24
Krak, J. B.....	82, 118, 122, 127, 128,
131, 181, 182, 393, 418	
Kuntz, John, mine.....	265
Kyle, Henry, mine.....	104

L

Lambert, C., mine.....	247
Lambert, J.....	330
Latimer, W. J.....	424
Laurel creek mines.....	213, 216
Laurel fork mine.....	201, 243
Laurel Hill, mine.....	167, 175
Laurel Hill district:	
Area of.....	13
Mines in.....	
.....201-2, 247, 261-4, 267-8, 271	
Sections in.....	58, 67, 152-4
Well records.....	330, 366
Lavalette, Fossils from.....	132
Lavalette section.....	112, 134
Lawrence, A., Nos. 1-6.....	324
Lawrence, A. G., No. 1.....	324
Lawrence, G. T., Nos. 1-6.....	324, 351
Lawrence, M. A., Nos. 1, 2, 4, 322, 348	
Lawrence, M. A., Nos. 3, 5 & 6.....	324
Lawson, Jas., Nos. 1, 3 & 4.....	316
Lawson, M. V., No. 1.....	316
Lawson No. 2.....	314
Left fork, Mine on.....	173
Lester, Millard, mine.....	177, 404-5
Lcvels above tide.....	458-473
Levisa fork.....	3
Lewis, Virgil A.....	6, 13, 18
Lewiston coal.....	235
Lick creek section.....	155
Lick fork mine.....	210
Likens, Harkins, minc.....	210
Lincoln county:	
Area by districts.....	13
Description of.....	13
Elevation of.....	13
Farm products.....	15
Pittsburgh coal.....	105
Population.....	13
Sections.....	48-68, 93-5
Timber.....	420
Towns.....	15
Valuation of property.....	15
Well records in.....	311-370
Well records, Summarized.....	312-331

	Page		Page
Lincoln district:		May, W. S., Nos. 1-8.....	314
Mines.....	179, 219, 253-5	Maynard, J., mine.....	255
Sections..70, 72-5, 78, 147, 148, 151,		Maynard, Lewis, mine.....	206
154, 156, 159-161, 227-31		Maynard, T. P., mine.....	258
Well records.....	372, 383-87	Meadows, J. C., mine.....	188, 494-5
Lincoln Land Assn. mines.....		M. E. Church well.....	320
174, 192, 197, 201, 202, 203, 265		Meigs clay loam.....	441
404-5		Methods of Representing structure.....	275
Lincoln Land Assn. No. 1.....	364	Meyers core test.....	77
Lincoln Land Assn. Nos. 2-4, 6,		Meyers heirs.....	372
138.....	330, 336, 337, 342, 363	Middle fork.....	30
Lincoln Land Assn. No. 5.....	60, 328	Middle fork, Mines on.....	166, 167
Lincoln Land Assn. No. 6.....	369	Middle Kittanning coal.....	184
Lincoln Land Assn. Nos. 33 & 34.....	353	Midkiff, F. M., Nos. 1-8.....	318
Lincoln Land Assn. No. 42.....	341	Midkiff quadrangle.....	467
Lincoln Land Assn. Nos. 82, 103,		Midkiff section.....	58
115.....	326, 353	Midkiff, W., mine.....	249
Lincoln well No. 19.....	286	Mill Creek, Butler dist., section.....	146
Linkous, Jas. No. 1.....	330, 365	Mill Creek, Grant dist., section.....	86
Linville, Claude.....	240, 404-5	Miller, D., mine.....	167
Little Clarksburg coal.....	122	Miller, H., mines.....	169, 404-5
Little Coal River Ry.....	461	Miller, H., No. 2.....	320
Little Fudges creek section.....	44	Miller, H. W.....	312
Little Lynn section.....	153	Miller, J. C., No. 1.....	330
Little Pittsburgh coal.....	119, 396, 404-5	Miller, John, mine.....	262
Location of area.....	1	Miller & Sands.....	253
Little Two Mile creek section.....	45	Miller, Seth, mine.....	241, 404-5
Locks and Dams:		Mills, M. J.....	372
Ohio river.....	2	Mills, Thos. G., mine.....	177
Big Sandy river and tributaries.....	3	Milton, Acct. of.....	11
Long branch section.....	35	Milton clays.....	413
Love, T. A., No. 2.....	292, 294	Milton oil field.....	231, 296
Lovejoy, Marine, mine.....	196	Milton quadrangle.....	464
Lovejoy Marine, well.....	330	Milton section.....	36
Lower Carboniferous rocks.....	34	Mingo county section.....	231
Lower Freeport coal.....	180, 398, 404-5	Mohlar tract.....	324
Lower Freeport limestone.....	181	Mohler Lumber Co., mines.....	
Lower Kittanning coal.....	184	.....186, 237, 238, 404-5	
Lower Marietta sandstone.....	81	Monongahela series.....	34-109
Lower Pittsburgh sandstone.....	118	Monongahela series, Coals of.....	394-6
Lower Sand Lick mine.....	254	Morgan, Lewis, mine.....	260
Lower Uniontown coal.....	97	Morgantown sandstone.....	123
Lower Winifrede sandstone.....	269	Morris-Harvey College.....	11
Lucas, A. F., mine.....	295	Morrison, Emily, Nos. 1-14.....	316
Lucas No. 1.....	64	Morrison Heirs, Nos. 1 & 2.....	316
		Morrison, Virginia.....	43, 294, 418
		Mountain limestone.....	285
		Mud river.....	29
		Mud river, Mine on.....	167
		Myra, Limestone near.....	118
		Mc	
		McAllister, W. H.....	413
		McClarity branch section.....	137
		McClellan, Nathan, mine.....	207, 404-5
		McClure, J. W., mine.....	170
		McClure, M., Nos. 1, 2, 5 & 6.....	318
		McClure, W., No. 4.....	318
		McClure, Weaver, Nos. 1-4.....	318
		McComas, C. L., Nos. 90 & 114.....	
		.....326, 357	
		McComas district.....	5
		McComas district, sections.....	
		.....47-8, 91-2, 115	
		McComas district, well records.....	
		.....294, 309-19	
		McComas, Inez, No. 1.....	360
		McComas, Talbott.....	326
		McCorkle, Acct. of.....	17
		McCoy, H. L.....	292
		McCullough, F. F., No. 1.....	292, 304
		McElroy, John, No. 1.....	313

M

Madison quadrangle.....	471
Mahoning sandstone.....	141
Malden sandstone.....	272
Mannington sandstone.....	83
Manns Knob section.....	66
Marcum, Bell, coal opening.....	231
Marine fossils.....	132
Markins, Catharine, mine.....	120
Marshall College.....	8
Martha section.....	43
Martin, Aaron, mine.....	166, 404-5
Martin, W. E., No. 1.....	292
Mason, Gordon, Nos. 4, 6, 10, 13,	
14, 21, 43-45.....	322
Mason, Gordon, Nos. 7 & 15.....	320
Mason, Gordon, No. 16.....	328
Mason, Mary E., Nos. 1-7.....	328, 341
Mason, Nathaniel, Nos. 1-4.....	312
Mason & Tackett wells.....	314
Mathews, H. E.....	10
May, C. W. & E. Z.....	320, 321
May, C. W. & E. Z., Nos. 1-15.....	322
May, Edw., Nos. 1-5.....	316
May, E. J., Nos. 1-15.....	314
May, Jas., No. 1.....	320
May, John, mine.....	120

	Page
McElroy, John, No. 3.....	320
McKeand No. 1.....	294, 303
McKinney, B. P.....	324
McKinsey, C. Co., mine.....	204, 404-5
MacKubin, C. C.....	73, 221, 268
McMillan, T. J., Nos. 70 & 95.....	330

N

Napier, Jas.	404-5
Napier, Julia, mine.....	214
Napier, Perlina, mine.....	211
Napier, Wm., mine.....	208, 404-5
Natural gas.....	281-388
Naugatuck quadrangle.....	469
Neal section.....	69
Nelson, P. W., No. 3.....	372
Nelson, R. W., mine.....	268, 404-5
Nelson, Sherman, mine.....	202
Nelson, Thos., No. 1.....	314
Nida, J. W.....	324
No. 2 Gas coal.....	273-4, 401, 404-5
No. 5 Block coal.....	184-223, 398, 404-5
Noe, Harrison, mine.....	203, 404-5
Norfolk & Western R. R.....	4, 461, 462
North Coalburg coal.....	183

O

Ohio river:	
Description of.....	27
Locks and Dams.....	2
Tributaries.....	28
Oil and gas development, history of	287
Oil and gas sands, interval to Pittsburgh coal.....	283
Oil and gas sands, Table of.....	282
Ona section.....	415
Osborn, John, mine.....	106
Osborn, Walter, mine.....	203-9, 404-5
Osborn, William, mine.....	213
Oxley, A. P., Nos. 1-5.....	318
Oxley, Benj., No. 1.....	314
Oxley, D. A., No. 1.....	324
Oxley, L., Nos. 1-5.....	322, 350
Oxley, S. W., mine.....	174, 404-5

P

Pack, Dee, mine.....	217
Pack, Jos. L.....	404-5
Pack, Josephine, mine.....	214
Palermo mine.....	195
Palermo section.....	158
Panther section.....	157
Parkersburg syncline.....	106, 136, 277
Parks, Mary.....	141
Parson, John, mine.....	106
Pauley, Benton, mine.....	172
Payne, W. C., mine.....	176
Peary, Wm., mine.....	207, 404-5
Peerless coal.....	272
Pell, Mason.....	236
Penclain, Evidences of.....	23
Perry, Alvis, mine.....	211
Perry, Jackson, section.....	137
Perry, Milton, mine.....	219
Peter Cave, Mine on.....	173
Petrolcum and Nat'l Gas, Chapter on	281-388
Physiography, Chapter on.....	23-33
Pine Creek limestone.....	138

Piney Mountain section.....	Page 40
Pittsburgh coal.....	99-103, 394, 404-5
Pittsburgh coal, Amount of.....	394-6
Pittsburgh coal, Little.....	119
Pittsburgh fire clay.....	419
Pittsburgh limestone.....	118
Pittsburgh red shale.....	135
Pittsburgh sandstone, Lower.....	118
Pittsburgh sandstone, Upper.....	118
Plumley, W., well.....	330
Plummer, Mary, mine.....	174, 404-5
Pomeroy sandstone.....	98
Poor Farm No. 1.....	324, 365
Poplar Grove core test.....	296
Population:	
Cabell county.....	6
Lincoln county.....	13
Wayne county.....	19
Porter Creek Oil Co.....	320
Porter Creek section.....	52
Porter, D. P., mine.....	212
Porter fork mine.....	170
Porter Knob section.....	89, 147
Porter, Ruhl.....	294
Porter, Wm., mine.....	212
Porter, Wm., No. 1.....	302
Porter, W. E., No. 1.....	290
Pottsville series:	
Coals of.....	409-403
Description of.....	225-274
Table of formations.....	226
Pound Fork sections.....	153
Powder Mill branch section.....	160
Powell, Jas., mine.....	165
Precipitation at Pt. Pleasant.....	428
Preston, A. W., wells.....	110, 372, 376
Price creek, Coal on.....	125
Price Heirs mine.....	258
Prichard, Robt., No. 3.....	372
Prichard wells.....	79, 372, 375, 377
Pridemore, Dan'l, mine.....	167, 404-5
Priestley section.....	62
Proctorville section.....	57
Production of coal.....	390-2
Prospective oil and gas territory.....	387
Prudential C. & Min. Co.....	273
Purdy, Albert.....	318
Pyle, Valentine, mine.....	126

Q

Quaker section.....	154
Queen, Asa F., coal opening.....	215
Queen Ridge section.....	149
Queens Ridge syncline.....	278

R

Raccoon creek, Coal near.....	114
Raccoon creek section.....	95
Radnor section.....	159
Railroads.....	3
Ramer, G. A.....	372
Raney, G. A., well.....	379
Ranger section.....	152
Raymond, Henry, No. 1.....	294, 309
Recent clays.....	412
Redstone coal.....	98
Reese Nos. 1 & 2.....	290
Reese, J. A., No. 1.....	298
Reid, C. A., mine.....	103
Reuben branch section.....	710
Rich creek section.....	150

	Page
Ridenhour, Nos. 1 & 2.....	314
River channels	24
River terraces	33
Roach, Coal near.....	105
Roach section	48
Roaring Creek sandstone.....	233
Roberts, S. A., No. 1.....	292
Roberts, S. A., Nos. 2 & 3.....	290
Robinson, Jas., mine.....	179
Roe, Frank.....	326
Rough stony land.....	443
Roy, Mrs. C. B., No. 187.....	326
Rucker, W. L., No. 1.....	45, 290
Russell, Wm., No. 6.....	372
Rutherford, J. R., mine.....	126, 464-5
Ryan, R. W., mine.....	189

5

Saint Albans quadrangle.....	462
Saltpetre section.....	161
Salt Rock section.....	47
Salt Rock, limestone at.....	127
Salt sand	283
Saltsburg sandstone.....	135
Sands & Miller wells.....	372
Sandy, John, No. 1.....	292
Sanson, Abraham.....	241, 464-5
Sanson, E.....	286
Sanson, Ed., Nos. 15, 17-21.....	324
Sanson, Lee N.....	372
Scary creek, Mines on.....	168
Schmidt & Kremer Nos. 1-3.....	314
School Property well.....	318
Scites, C. A., Nos. 35 & 194.....	326
Scites, Hiram, mine.....	191
Scites, W., No. 268.....	326, 464-5
Seaboard Fuel Co., Nos. 1-4.....	171, 172, 186, 187, 188, 464-5
Seaboard Fuel Co., Nos. 1-4.....	330, 333, 334

Sections, Geologic:

Arkansas branch.....	73
Beechy branch.....	151
Bernie	60
Big Creek, Chapmansville dist.....	64
Big Hurricane.....	140
Bobs branch.....	69
Bowen	111
Bowen creek	91
Branchland	57
Brushy fork.....	144
Bulger	62
Central City.....	38
Ceredo	137
Charley creek.....	46
Clover	86
Cobbs creek.....	64
Cove Gap.....	115
Crawford, W. H.....	139
Crown City Ferry.....	42, 87
Crumm	228
Cyrus	113
Doane	147
Dry creek.....	89
Dunlow	72
Eloise	149
Ferguson	151
Fleming	156
Fort Gay.....	76, 411
Fourteen P. O.....	67
Fudges creek.....	90
Garrets Bend.....	55
Genoa	229

Sections, Geologic—Continued:

Glenhayes	75
Green Bottom	41
Green Shoals.....	59
Griffithsville	49
Hamlin	55
Harts Station.....	226
Heaths creek.....	91
Hodges	42
Hooker Knob.....	74
Hubbardstown.....	77
Huddleston Knob.....	58
Howell	85
Island creek.....	140
Jackson branch.....	748
Joel branch.....	156
John branch.....	85
Johnson	115
Julian	145
Kavanaugh	79
Kenova	68
Kermit	228
Kilgore	84
Lavalette	112, 124
Lick creek.....	155
Little Fudges creek.....	44
Little Lynn.....	153
Little Two Mile creek.....	45
Long branch.....	35
Manns Knob.....	66
Martha	43
McClarity branch.....	137
Midkiff	58
Mill creek.....	86
Milton	36
Neal	69
Ona	415
Palermo	158
Panther	157
Parks, Mary.....	141
Perry, Jackson.....	137
Piney Mountain.....	40
Porter creek.....	52
Porter Knob.....	89, 147
Pound fork.....	153
Powder Mill branch.....	160
Priestley	62
Proctorville	37
Quaker	154
Queen Ridge.....	149
Raccoon creek.....	95
Radnor	159
Ranger	152
Reuben branch.....	110
Roach	48
Saltpetre	161
Salt Rock.....	47
Shoals	112
Stonewood	78
Stowers Knob.....	57
Sugar Camp Knob.....	98
Sulphur Spring.....	159
Sycamore creek.....	157
Sycamore fork.....	63
Toms creek.....	92
Turkey Camp Knob.....	70
Union Ridge.....	88
Upton	158
Valley fork.....	94
Watts Ridge.....	70
Wayne	116
Wells branch.....	160
Wheeler Knob.....	71

	Page
Whites creek.....	114
Wilsondale	227
Yawkey	53
Seven Mile Cr. mine.	102
Sheets, Geo.....	324
Sheppard, J. A.....	229
Sheridan district:	
Area of.....	13
Mines in.....	175, 243, 266
Sections	57
Well records.....	324-30, 357-64
Shoals section.....	112
Short, Wm., mine.....	101
Simmons, C. S., mine.....	125
Skeens, Benton, mine.....	197, 404-5
Skeen, Z. A., wells.....	372, 378
Smith & Beckett No. 1.....	292
Smith, Elijah, mine.....	253
Smith, Ira.....	330
Smith, John, mine.....	190, 215, 252, 404-5
Smith, J. J., mine.....	178
Smith, Marion, mine.....	178
Smith, Moses, mine.....	259
Smith, R. M.....	192, 404-5
Smith, W. B.....	133
Soils, Chapter on.....	424-57
Sowards, E. E., No. 1.....	324, 330
Spears, Jack.....	372
Sperry, Foster.....	330
Spurlock, E., No. 137.....	330
Spurlock, Kelley, mine.....	196
Spurlock, M. A., No. 1.....	322
Spurlock, Thos., mine.....	357
Stephens, J. F., Nos. 1-4.....	330
Stephens, John, No. 13.....	318
Stephens, J. W., Nos. 1-9.....	322
Stephenson, S., mine.....	260
Stepp, Morgan, mine.....	221
Stepp, Hrs., Thos., Nos. 1-3.....	372
Stepp, Thos., No. 2.....	274, 384
Stepp, T. J., No. 1.....	78
Stettinius, J. L.....	372
Stevenson, J. J.....	122, 130, 136
Strickler, Jas., Nos. 1-5.....	316
Stockton-Lewiston coal.....	235, 400-1, 404-5
Stonecoal, Acct. of.....	22
Stonecoal section.....	78
Stonewall district:	
Mines in.....	177, 296-14, 252
Sections	70, 143, 153, 155, 162
Well records.....	372, 376-381
Stowers, Alonzo.....	330
Stowers, Alonzo, No. 50.....	324
Stowers, E. W., No. 88.....	330
Stowers, John, mine.....	169
Stowers, John, No. 1.....	324, 404-5
Stowers, Lucy, No. 87.....	330
Sugar Camp Knob section.....	93
Sulphur Spring section.....	159
Swan, A. A., Nos. 1 & 2.....	290
Swan, T. A., No. 1.....	292
Swan, Walter, No. 1.....	310
Swan, Walter, Nos. 1, 2 & 3.....	294
Swisher & Elkins.....	326
Sycamore creek mine.....	240
Sycamore creek section.....	157
Sycamore fork section.....	63
Synclines, Description of:	
Ferrillsburg	279
Griffithsville	279
Parkersburg	277
Queens Ridge	278

	Page
"Table rocks".....	355
Teays valley	24-26
Teays valley clays.....	412
Terraces of rivers.....	33
Thacker, R., mine.....	103
Thornton, Page, No. 1.....	316
Thornton, Page, No. 4.....	352
Timber in area.....	419
Tomlin, John, mines.....	219, 258, 404-5
Toms creek section.....	92
Toney, Albert, mine.....	271, 404-5
Toney, Brad, mine.....	274, 404-5
Topography of land.....	32
Transportation, History of.....	1
Triangle well.....	326
Trimble, Wm., No. 1.....	324, 332
Tug fork.....	3, 32
Turkey Camp Knob section.....	70
Turley, N. J., No. 1.....	324, 333
Turley, N. T., mines.....	188, 189, 404-5
Turnpikes	5
Twelvepole branch	461
Twelvepole creek	30
Tyler silt loam.....	451

P

Union dist., Cabell county:	
Area of.....	5
Sections	41-42, 85-88
Well records	294, 295-6
Union dist., Lincoln county:	
Area of.....	13
Mines	174-5, 190-2
Sections	57-157
Well records	328-30, 355-7
Union dist., Wayne county:	
Area of.....	18
Mines	177-8
Sections	71, 110-12, 116
Well records.....	372, 375
Union Ridge section.....	88
Uniontown coal	97
Uniontown limestone	97
Uniontown sandstone	97
Upper Carboniferous rocks.....	34
Upper Dunlow coal.....	259
Upper Freeport coal.....	163-179, 397-8, 404-5
Upper Freeport sandstone.....	179
Upper Kittanning coal.....	183
Upper Pittsburgh sandstone.....	98
Upper Winifrede sandstone.....	260
Upton creek mine.....	243
Upton section	153

V

Valley fork section.....	94
Vance, A. J., mine.....	251
Vance, Richard, mine.....	266
Vickers fork, Mine on.....	173
Vickers, Thos, mine.....	263, 404-5
Vinson, L. K.....	372
Virginia Land Co., mine.....	170, 404-5

W

Wade, A. P. No. 1.....	318, 318
Wade, W. I., No. 1.....	320
Wagoner, Peter.....	104
Walden, M. H., mine.....	274, 404-5

	Page		Page
Walker, R. W., mine.....	205	White, Dr. David.....	223, 394
Wallace, J. N., No. 1.....	392	White, E., No. 1.....	312, 352
Walters well.....	324	White, Eph., No. 1.....	316
Walton No. 1.....	290, 302	White, I. C.....	81, 111, 123, 137, 138,
Warfield coal.....	273-4, 401	139, 162, 185, 225, 255, 260, 269,	
Warfield quadrangle	469	272, 277, 286, 288	
Washington district:		White, Jas., Nos. 1, 2, 3 & 4.....	314
Area of.....	13	White, John, Nos. 1 & 2.....	292
Mines	171, 183-8, 236-8	Wiley, Lucian, mine.....	218
Sections	62-93	Wilkinson, C., mine.....	172
Well records.....	324, 330, 332-34	Wilkinson, Jesse, mines.....	164, 165, 404-5
Waterways	1	Williams, John	221
Watts, Noble, mine.....	207, 404-5	Williams, J. W.....	290
Watts Ridge section.....	70	Williams well	324
Wayne, Acct. of.....	20	Wilson, A. W mine.....	254
Wayne county:		Wilson, A. W., No. 1.....	372, 386
Area by districts.....	18	Wilson, A. W., wells.....	73, 372
Coal, available.....	395-493	Wilson, Deck, No. 1.....	326
Description of.....	17	Wilson, Elin, mine.....	187
Elevation of.....	18	Wilson, Felix, well.....	372
Little Pittsburgh coal.....	120	Wilsondale section.....	227
Pittsburgh coal.....	106-9	Winifrede coal.....	261, 401, 404-5
Population	19	Winifrede, Lower, sandstone.....	269
Farm products.....	19	Winifrede, Upper, sandstone.....	260-268
Sections.....	68-80, 95, 110-17	Winters, Chas.....	294
Stockton-Lewiston coal.....	251	Wintz, Lewis, mine.....	102
Timber	422	Wood, L. F., No. 1.....	292, 301
Towns	20	Woodruff, Thos.....	292
Valuation of property.....	20	Woodrum, B., No. 1.....	328, 340
Well records.....	370-387	Woodrum, Julia, Nos. 1-4.....	325
Well records, Summarized.....	372-373	Woodrum, Peter, Nos. 1 & 2.....	328
Wayne quadrangle.....	466	Wooten, P. M., No. 2.....	372
Webb, Mont, core test.....	229	Workman, Ellen, Nos. 1-6.....	320
Wells Branch Coal Co.....	253	Workman, Randolph, mine.....	107
Wells Branch section.....	160	Workman, Sarepta, No. 1.....	48, 312
West fork.....	31, 183	Workman, Sarepta, No. 2.....	320
West Hamlin, Acct. of.....	17	Wright, J. H., No. 1.....	294, 307
West Virginia Asylum.....	9		
Wheeler, A., coal opening.....	166, 404-5		
Wheeler, David, mine.....	255		
Wheeler Knob section.....	71		
Wheeling fine sand.....	445		
Wheeling silt loam.....	444		
Wheeling silty clay loam.....	446		

Y

Yates, Frank, fire clay analysis.....	412
Yawkey, Acct. of.....	16
Yawkey section.....	53
Young, J. T.....	312

